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## Original Communications

# DYSCHONDROPLASIA

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MULTIPLE bony prominences have been known to occur on the skeleton of certain individuals since olden times. According to Reinecke,[1] Stanley first recorded the familial tendency in 1849. There are an increasing number of papers relative to the subject, particularly concerning the clinical and roentgenologic characteristics of the affection and the prevalence of this particular type of osseous dystrophy; yet it is still generally considered to be rare, and a lack of familiarity with the disease is the rule. Etiology of the disease and therapy are still unpenetrated fields. Also confusing is the question of terminology and classification. Such a variety of terms have been used to designate the condition that one selects the name most appealing to him, or invents a new one. Some of these are: hereditary multiple exostoses (Gibney,[2] 1876); multiple exostoses (Gibney,[3] 1879); multiple cancellous exostoses (Davis[4] and Vaughn[5]); multiple cartilaginous exostoses (Ashurst[6] and Lewin[7]); *multiplen Wachstumsexostosen* (Reinecke[1]); dyschondroplasia (Ollier[8]); chondrodysplasia (Dwyer,[9] Cole,[10] and Cleveland[11]); diaphyseal aclasia (Keith[12]); hereditary deforming chondrodysplasia (Ehrenfried[13]); multiple congenital osteochondromas (Boggs,[14] and Carman and Fisher[15]); Ollier's disease (Richard, Dupuis, Roederer, and Froyez[16], and Hunter and Wiles[17]); familial deforming chondrodysplasia (Gorsline[18]); multiple cartilaginous enchondroses (Haas[19]); and familial chondrodystrophy (Hilton[20]).

*Classification.*—The individuality of the condition and its relationship to other developmental anomalies affecting the skeleton is still subject to question. In 1898 Ollier[21] recorded a single case of bilateral multiple exostoses which he had seen in a beggar in Egypt. In 1899 he[8] called attention to a condition which he named dyschondroplasia. He had seen four cases, one a case of multiple exostoses in a child some years before this, the records of which were lost. The second case

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was in a child six and a half years old who had a curved right forearm, exostoses on the right femur, and shortness of the upper and lower extremities on the right side only. X-rays taken when the child was seven and a half years of age showed incomplete ossification of the metaphyses. A third case similar to the others occurred in a girl nine years of age, except that both sides were equally affected. He observed a fourth case in a girl thirteen years of age. The long bones of one side only were affected, but both hands were involved. Ollier[8] concludes that one would judge that the lesion of the long bones is unilateral. He did not mention in his second paper the beggar he described in 1898, but he did say that dyschondroplasia was related to osteogenic exostoses.

The influence of Ollier's paper has been extensive. He showed by x-rays which had not long been available for clinical use at the time, that in cases with multiple exostoses there is another finding more fundamental; viz., incomplete areas of ossification of the metaphyses, clear areas in the juxtaepiphyseal portions of the long bones. He found by biopsy that the clear areas in the phalanges were due to cartilaginous masses, described the underlying pathology more accurately, and named the condition "dyschondroplasia," a term calling attention to the fundamental lesion, a disturbance in the growth of the epiphyseal cartilage, and ossification of the metaphyses. But to von Bergmann must be given, according to Frangenheim[22] and others,[23, 24, 4, 14] the credit of first attributing the cause to a disturbance in the epiphyseal cartilage. The confusing part about Ollier's[8] report is that he regarded one characteristic of the affection as unilaterality or thought that involvement of the larger bones is unilateral. However, the first and third cases in his second paper[8] may not have been bilateral. He says that dyschondroplasia is similar to osteogenic exostoses. Since certain authors (Cole,[10] Hunter and Wiles[17]) have regarded unilateral dwarfing with multiple exostoses affecting one side as an individual clinical entity, separate from generalized multiple exostoses, a controversy exists as to the relationship of the two conditions. Most authors regard them as the same disease (Frangenheim,[22] Ehrenfried,[13, 25] Jansen[26]). Molin,[27] a student at Lyon, published his thesis on dyschondroplasia in 1900. He reported four cases, all of which had an asymmetrical unilateral involvement, except one which had the left upper and the right lower extremity involved. Subsequent studies show that such dystrophies affecting only one side are much less common than similar cases in which both sides are involved. Ollier[8] apparently may have attempted to emphasize the unilateral case as the true type of what he called dyschondroplasia. In two of the most important contributions to the subject, Ehrenfried,[13, 25] in 1915 and in 1917, called attention to the prevalence of cases of mul-

tiple exostoses and emphasized the hereditary basis which could be proved in a large percentage of instances. Removing a specimen from an area crossing the epiphyseal line, he found a dysplasia of cartilage cells of the epiphyses. He described the general clinical and roentgenologic characteristics of the disease, included disseminated and unilateral cases, and chose to use the name "hereditary deforming chondrodysplasia," which because of his articles has become a popular name for the disease in this country. He regarded the bilateral cases and the unilateral cases as the same disease.

In 1915 Albers-Schönberg[28] described a hitherto unrecorded type of skeletal dystrophy characterized by roentgenologic appearance in the bones of rounded or irregular areas 2 mm. to 5 cm. in diameter, which were more opaque to x-rays, areas he thought of condensation of calcification. The diaphyses of long bones were not involved, but the metaphyses and epiphyses were. The only bones that were entirely free of the appearance were vertebrae, skull, scapulas, and patellas. There was a suggestion of exostosis on one humerus. He regarded the affection as a developmental defect. In viewing Albers-Schönberg's plates, a suggestive broadness of the metaphyseal region of the long bones is noted, a finding, if true, which even more decisively puts this case in the class of dystrophies under discussion. The exostosis is quite definite.

Voorhoeve,[29] in 1924, reported findings in a brother and sister, aged fourteen and ten years, respectively, in which the principal findings were longitudinal striations in the bones, especially in the juxta-epiphyseal regions. These very definite straight striations were not due so much to increased density as to incomplete ossification along alternate lines. The densest areas had approximately the same density as the mid-diaphyseal regions which were apparently normal. On the other hand, the areas of condensation in Albers-Schönberg's case[28] were more dense than normal. In Voorhoeve's[29] cases the broadness of the metaphyses extended an abnormal distance up the shaft, and small exostoses were found in the metaphyseal regions. Voorhoeve[29] believed that his cases and Albers-Schönberg's case[28] are types of dyschondroplasia. Fairbank[30] reported a case of a boy aged twelve years with roentgenologic findings which are almost identical with those of Voorhoeve's cases.[29] The lower extremity on the left side in Fairbank's case[30] is shorter than that of the opposite side which fact is further evidence that the type of dystrophy is related to that described by Ollier.[8] Fairbank[30] did not know the disease he described. He quotes Bentzon,[31] but not Voorhoeve.[29] Bentzon's case[31] resembled the type described by Voorhoeve.[29] A case similar to that reported by Albers-Schönberg[28] has not been found recorded, and this extreme rarity, together with the fact that the stippling found in the hereditary de-

forming chondrodysplasia type of dyschondroplasia is usually not due to an increased density but to an incomplete ossification in surrounding areas, weakens the conclusion that Albers-Schönberg's case[28] is a type of dyschondroplasia. However, the juxtaepiphyseal distribution, broad metaphyses, and exostosis leave little doubt that it is related to dyschondroplasia.

Freund[32] reported a case which he called "osteodystrophia fibrosa unilateralis," which he believed to be related to Ollier's dyschondroplasia. Freund's case[32] was unilateral with facial asymmetry, but the whole diaphysis as well as the metaphyses of the long bones was affected. There was a diffuse osteoporosis without cyst formation. Biopsy showed the haversean canals to be enlarged by osteoclastic resorption, and so suggestive were some of the appearances of osteitis fibrosa cystica that the patient was explored for a parathyroid tumor. This condition is not included in the classification by the author because the principal lesion was not in the metaphyses.

Cole[10] in 1926 believed that the term "Ollier's disease" should be reserved for those cases of cartilaginous dystrophy which show an asymmetrical involvement of the skeleton. Hunter and Wiles[17] attempted to differentiate Ollier's dyschondroplasia from hereditary deforming chondrodysplasia on the basis of four features. First, in hereditary deforming chondrodysplasia heredity is a striking finding, whereas in Ollier's type of dyschondroplasia heredity is infrequently proved. Second, enchondromas are almost invariably in the former. They may occur in the latter but are not so frequently found. Third, broad metaphysis is constant in hereditary deforming chondrodysplasia but, according to them, not in Ollier's dyschondroplasia. Fourth, they say there is fairly regular calcification giving homogenous roentgen shadow to the bone in hereditary deforming chondrodysplasia. Differences undoubtedly occur in the two conditions, but they are relative. Unquestionably in the unilateral and bilateral cases incompletely ossified areas occur in the juxtaepiphyseal areas, osteochondromas occur, and restricted growth of the affected bones is found. It is true that the unilateral cases are likely to be sporadic in which heredity cannot be demonstrated, but in some bilateral cases heredity cannot be proved. Exostoses seem to be more numerous and more prominent in the bilateral cases. In both, the broadness of the metaphyses extends over a greater portion of the bones than the normal metaphysis even if this is relatively more pronounced, as Hunter and Wiles[17] maintain, in the bilateral type. One who has carefully studied the pictures presented by Coon[33] of a boy fifteen years of age who had the disease will forever distrust the strict unilaterality of the disease in any cases not proved by complete x-ray films of the skeleton. The clinical picture shows the short right arm and leg, and

roentgenograms of this side reveal the unmistakable findings of Ollier's type of dyschondroplasia. Roentgenograms of the opposite side also disclose signs of the disease, though not so pronounced. On the side apparently not affected in the clinical picture of the patient, the roentgenograms show longitudinal striation, abnormal curvature, small exostoses, and other manifestations of involvement.

Even without a history of occurrence of the disease in a family, it is questionable whether multiple exostoses occurring in an individual can be differentiated as a distinct entity from dyschondroplasia of the hereditary deforming chondrodysplasia type. Sporadic single exostoses on a skeleton are not to be classed with this disease, but multiple exostoses occurring in a single individual of a family can be shown to have the characteristics of dyschondroplasia. They affect mainly the metaphyses of long bones and show other evidences that definitely put them in this class. Because dyschondroplasia can be latent, it is difficult to definitely prove that heredity is not a possibility.

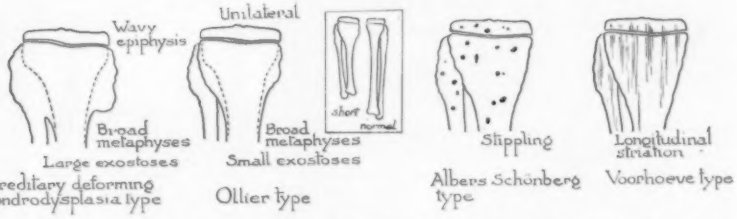



Fig. 1.—Diagrammatic representation of four different types of dyschondroplasia showing the predominating x-ray characteristics of each type.

Because all these conditions affect the bones mainly in the juxta-epiphyseal regions, are developed during the growth period, and are characterized by disturbances in cartilaginous growth, ossification, and failure of proper diaphyseal formation (lack of resorption and remodelling of the metaphyses), the author prefers to call them all dyschondroplasia and designate them as four main types (Fig. 1) in which one or another characteristic predominates:

Dyschondroplasia

1. Ollier's type (unilaterality).
2. Hereditary deforming chondrodysplasia (Ehrenfried) type, many exostoses, broad metaphyses, heredity frequently proved.
3. Voorhoeve's type. Longitudinal striation of metaphyses is the most prominent feature.
4. Albers-Schönberg's type. Areas of increased density in the metaphyses and epiphyses are the most prominent features.

*Incidence.*—In 9,442 admissions to the Hutchinson Memorial Clinic of Tulane University there have been five cases of dyschondroplasia (hereditary deforming chondrodysplasia type), three cases of achon-

droplasia, one case of hyperteliorism with dwarfing, and six cases showing single exostoses. There have been no cases of Morquio's disease, no cases of osteogenesis imperfecta, hyperchondroplasia, Madelung's deformity, or aplasia of an extremity. There has come under my care another case of dyschondroplasia of the hereditary deforming dyschondroplasia type, an abortive form discovered in a child who

Fig. 2.—*A* and *B*, Case 1, before operation, showing the bony prominences and deformities mentioned in the text. *C*, After removal of osteochondroma from femur. Note pronation of hands, marked irregularity in growth of bones, and the prominences (exostoses) near the ends of the long bones. The patient is of short stature.

was x-rayed because of fracture. The only evidence of the disease in this case was deficiency in growth of the terminal end of the ulna with a pointed tip and broad metaphysis resulting in the typical arrowhead deformity. This appearance is so characteristic that it is unmistakably dyschondroplasia.

## CASE REPORTS

CASE 1.—E. B., No. 7083, white male, aged twelve and one-half years, with hard, painless, irregular masses attached to the long bones of the extremities and other bones of the body. The masses were first noted in infancy; the exact date of their appearance could not be determined. Beginning as small lumps on the bones in the region of the joints, they gradually increased in size. One mass on the inner mesial aspect of the right femur had grown in size more rapidly than the others until now it is the size of a grapefruit and interferes with his walking (Fig. 2.) He had failed to grow in height properly. His father and other members of his family were affected (Chart 1), and it was noted that those members of the family affected on reaching full growth were of short stature (height 5 feet 1 or 2 inches), whereas other members of the family who were not affected were all taller. Exami-

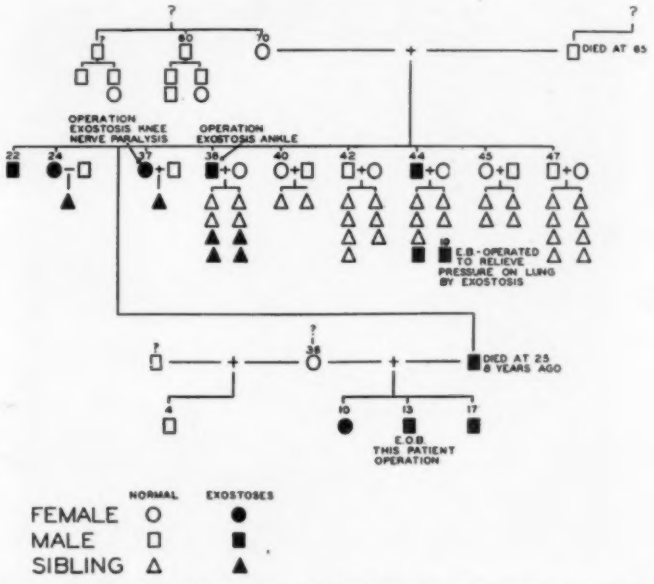



Chart 1.—Showing the incidence of dyschondroplasia (hereditary deforming chondrodysplasia type) in the family of patient in Case 1. Of fifty-two members excluding ten mates of two generations of the family, seventeen (one-third) had the disease.

nation revealed a well-nourished, well-developed, intelligent boy, stubby but with good musculature. He walked with a waddling gait in order to clear a large mass projecting mesially from the lower end of the right femur. Valgus deformity of the right knee and varus deformity of the left were noted on standing. There were numerous exostoses of the extremities near the ends of the long bones, especially marked at the lower end of the femurs, upper ends of the tibias, the lower ends of the radii and ulnas, and the proximal ends of the humeri. Supination of each forearm was limited 45 degrees. There were numerous small exostoses on the hands and feet. The spine and skull and bones of the face showed no abnormalities, but the nasal septum, which was abnormally broad and cartilaginous, encroached on each air passage. The scapulae and pelvis were not clinically involved, nor were the ribs.

Laboratory findings included leucocytes, 10,000 per cubic millimeter; eosinophiles, 14 per cent; strongyloides in the stool, and urine negative.

*Roentgenograms of Right Forearm and Hand.*—In the lower third of the radius and ulna, jutting into the interosseous space are moderate-sized osteomas that abut on each other. Apparently there is no fusion between the two. The bones are separated and the interosseous space is wider than normal. A small exostosis arises from the distal metaphysis of the radius on the outer side, and this together with the normal metaphysis makes the juxtaepiphyseal portion of the bone wider than the epiphysis. The distal end of the ulna is not pointed and shows no exostosis. The metaphyses are irregularly and insufficiently calcified, with the result that transverse and longitudinal trabeculation stands out. The left forearm shows similar changes, but they are more exaggerated. An irregular bony projection arises from each bone

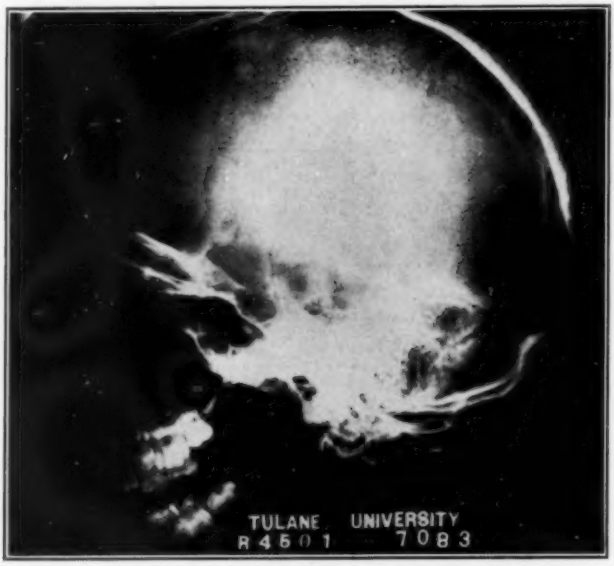



Fig. 3.—X-ray film of skull in Case 1 shows irregular calcification, a finely mottled appearance.

at the distal end and is directed into the interosseous space. The distal end of the ulna is pointed, and there is a very small epiphysis. The epiphyseal line of the radius is curved and irregular.

Metacarpals of both hands show insufficient calcification at the juxtaepiphyseal regions, and there are several small irregular exostoses originating from metaphyseal regions. The fourth and especially the fifth metacarpals of the left hand are relatively short when compared with the second and third. Also the head of the os magnum is disproportionately large when compared with the body of the bone.

Roentgenograms of the skull show an indistinct, furry, irregular type of calcification (Fig. 3).

Roentgenograms of the lower femurs, knees, and upper part of the tibias show on the medial aspect of the right femur a large bony mass with a broad base, no visible cortex, and treelike radiating calcification (Fig. 4). The base is approximately as wide as the diameter of the wide metaphysis at this level, and the diameter

and width of the mass is slightly greater than this. The right tibia is curved concave outward in the upper third. The metaphysis of the tibias and femurs show the broadness of the epiphysis extending for an abnormal distance on the diaphysis, and there is irregular, insufficient calcification and thin cortex. A few other very small exostoses are seen. The fibula heads are large and are poorly calcified. These insufficiently calcified areas show streaking and stippling, an abnormality which seems to involve also the epiphysis proper. The epiphyseal lines are slightly irregular.

The large osteocartilaginous mass on the mesial aspect of the right femur was removed on March 12, 1935, under general anesthesia. The entire capsule and part of the attached muscles were removed with it in order to avoid detaching cartilaginous or bone-forming elements that would favor a recurrence. It was noted at the time

Fig. 4.—Roentgenogram of knees in Case 1. The large osteoma is evident in the lower end of the right femur. Note the irregular calcification of the metaphysis and the broadness of the metaphysis due to failure of diaphysation. The epiphyseal lines are wavy and the right tibia is curved.

the base was being chiseled from the shaft of the femur that it was very soft, not uniformly ossified. The mass measured 9 × 9 cm. It was covered by a soft cartilaginous capsule. The central portion showed numerous hard, bony trabeculae, and a yellowish surface which had an oily moisture.

Sections were taken from the surface, the central part of the mass, and the center of the pedicle (Fig. 5). Microscopic examination of slides prepared from these showed on the surface the connective tissue capsule, a thin fibrous perichondrium beneath which was cartilage with moderate-sized cartilage cells. These cells became larger in the deeper portion of this cartilaginous cap. The cartilaginous

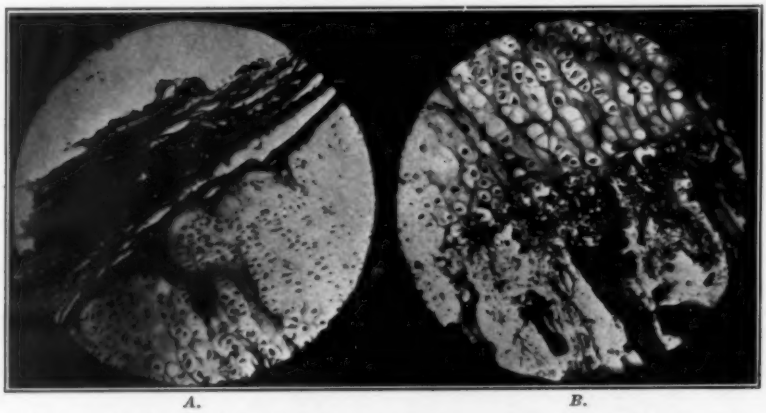
zone showed absolutely no evidence of ossification. It stopped abruptly and subjacent to it was a zone of cancellous bone, a few bony trabeculae, no compact bone. Red marrow is found between the trabeculae. In the deeper areas are trabeculae of cancellous bone, in the interstices of which is found fat and occasionally some few marrow cells.

CASE 2.—J. R., No. 3022, negro male, aged eighteen years, had had since infancy abnormal bony prominences noticeable at the right humerus below the insertion of the deltoid and near the knees. There was no family history of a similar affection. He came because the mass on the right humerus had been rapidly increasing in size.

Examination revealed a well-nourished, well-developed young negro. There were abnormal, irregular, bony prominences projecting from the long bones near the knees and at the upper end of the right humerus a well-developed mass, 8 × 6 cm., firmly fixed to the bones.

The laboratory findings showed hemoglobin, 95 per cent; erythrocytes, 5,255,000; leucocytes, 6,250; urinalysis, negative.

*Roentgenograms of the Knees.*—The broad part of the metaphysis of the femur extends well up the shaft (Fig. 6*A*). The cortex is thin, and there is some evidence



*A.* *B.*

Fig. 5.—*A*, Microscopic section of cortex of osteoma removed from Case 1. There is no evidence of ossification. No osteoblasts invading from the surrounding fibrous tissues.

*B*, Deeper section at junction of cortex and medulla showing the large cartilage cells and abrupt change to spongy bone beneath. There are a few osteoblasts and no evidence of calcification of the matrix of the cartilage which should normally occur as a groundwork for bone formation.

of longitudinal striation and stippling. Sharp pointed exostoses project upward from each femur at the junction of the shaft and metaphysis. Several small exostoses project from the metaphysis of the tibia. The same evidences of incomplete calcification are present. The head of the fibula on the left has definitely fused with the tibia. It is irregular, but no exostoses are seen on its lateral side. The interosseous space is wide and gives the appearance that the head of the fibula was pushed away from the tibia. In the head of the right tibia similar changes are found, but they are less marked. The epiphyseal lines of the tibias and femurs are faintly visible. Their contours appear regular.

The upper end of the right humerus shows several exostoses at the junction of the middle and upper thirds. One is large with a length as great as the diameter of the shaft. It points outward and downward (Fig. 6*B*).

No other x-ray plates were taken.

The patient refused to have the exostosis removed from the humerus.

CASE 3.—H. H., No. 8003, white male, aged eight years. When aged three years, he was observed by the parents to have a small, abnormal, bony projection just below the right knee. It increased in size and within two years had again entirely disappeared. When he was five years of age, nodules were noted in the region of the knees, wrists, shoulders, fingers, and these have progressively increased in size until when at the age of eight years, when he was examined at the clinic, they were numerous and varied from the size of a small marble to that of a golf ball.

Examination revealed a well-developed and well-nourished boy, height 51½ inches. In the region of the ends of the long bones of the extremities were firm, irregular projections, painless and attached to bone, but subcutaneous and unattached to skin. Knees, wrists, elbows, shoulders, scapulae, humeri, and ribs had exostoses. The head, face, and spine were uninvolved.

Roentgenograms of the upper portion of left humerus and left side of chest show multiple exostoses in metaphyseal region of humerus. The metaphysis is broad

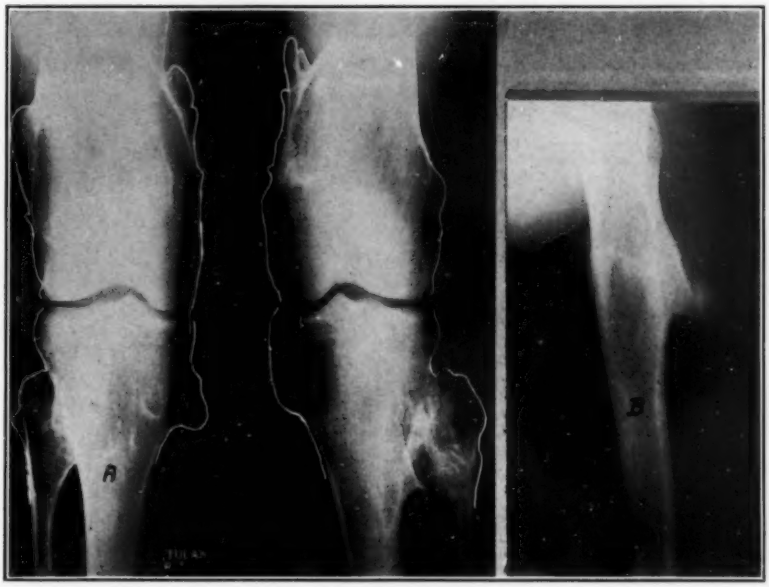



Fig. 6.—Case 2. *A*, The roentgenograms have been retouched to preserve the outline of the bones. Numerous exostoses are seen pointing away from the epiphysis. There is fusion of the tibia and fibula and a broad metaphysis.

*B*, The sharp exostoses of the humerus point away from the adjacent epiphysis.

with a thin cortex. With the exostoses the metaphysis is broader than the normal appearing epiphysis. The epiphyseal line is irregular and not typically conical. Small exostoses are visible on the fourth left rib outside the angle and on the scapula.

Roentgenograms of the upper portion of right humerus and right side of chest show an expanded metaphyseal portion of the right humerus with several moderate-sized exostoses and thin cortex. The coracoid process seems irregular, and there is an exostosis on the body of the scapula.

Lower ends of tibia and fibula: On the right the lower end of the fibula is curved concave inward. The epiphyseal line of the fibula is higher than normal, being on the level with that of the tibia (Fig. 7). The metaphysis of the fibula is wide for an abnormal distance up the shaft, and it is imperfectly ossified with a thin cortex. The epiphyseal line of the tibia is not straight across but is wavy, being higher

at one place than at another. Stippling or irregular calcification seems to be present in the metaphyses. On the left the lower end of the tibia as well as the fibula seems to be slightly curved. The metaphysis of the tibia is broad and slightly stippled, and the epiphyseal line is wavy.

Roentgenograms of knees: The tibial metaphyses are broad for some distance down the shaft, and there are longitudinal striations and stippling. One area is moderately deficient in calcification. The epiphyseal lines are wavy. The fibula heads show less perfect calcification. They are irregular in outline, and there are several exostoses, especially on the left, and these give the appearance of pointing up or toward their adjacent epiphyseal line, an unusual finding since osteochondromas, as a rule, have their apex directed away from the adjacent epiphysis. However, the exostoses in this instance are so small one cannot be sure of the direction. The width of the metaphyseal area is much greater than the relatively small epiphyseal

Fig. 7.—Case 3. The lower ends of the tibias and fibulas show irregular calcification with a wavy epiphyseal line. The epiphysis on the fibula of the right leg is abnormally high, being on a level with that of the tibia, whereas normally it should be at the level of the joint. Curving of the tibia and fibula is noted.

line. The lower ends of the femurs appear almost normal. There are several small spurlike exostoses pointing away from the epiphyseal line. There is a suggestion of streaking in ossification.

Roentgenograms of hands and wrists (Fig. 8): The phalanges and metacarpals show what appear to be osteoporotic areas with a suggestion of linear streaking. There are no clear punched-out areas suggestive of enchondromas, but there are small exostoses. These tend to be near the epiphyseal lines; i.e., distal on the metacarpals, except the first; proximal on the phalanges and first metacarpals. The metacarpals are disproportionate in size, the fourth and fifth on each hand being relatively much shorter than the others. The right radius has an abnormally small epiphysis which is faced in on a curved epiphyseal line. The metaphysis of the radius is wider than the epiphysis, even that part of the metaphysis immediately adjacent to the epiphyseal line. A large irregular exostosis springing from the radius occupies the interosseous space and approaches a smaller one on the ulna. The inferior radio-

ulnar joint is widely separated. The epiphysis of the ulna is extremely small, and the metaphyses of the radius and ulna are incompletely ossified and have very thin cortices. Practically the same changes are found on the left side, but they are less marked. The distal metaphysis of the ulna here tends to be more pointed. The carpal bones show slight changes suggesting irregular calcification, and their forms are slightly bizarre.

CASE 4.—W. A. H., No. 8004, white male, aged thirty-eight years, is the father of patient in Case 3. When he was two and one-half years old, his parents first noticed nodular prominences at the lower end of the femurs. When he was six years old, the nodules appeared about the elbows and at the lower angle of each scapula. Painless, they gradually increased in size. No increase in size of the tumors occurred after he was eighteen years of age. An exostosis was removed from the right os calcis when he was thirty-two years old, because it interfered with walking.

Fig. 8.—Case 3. There is irregular calcification of the bones of the hands and adjacent part of the radius and ulna. The metacarpal bones are disproportionate in length, the fourth and fifth being relatively shorter than the others. Note that the small exostoses occur near the epiphyseal line. Some of the carpal bones are bizarre abnormal shapes. Each ulna is short. There is a false radio-ulnar joint on the right and failure of development of the epiphysis of the ulna on the right. The metaphysis of the radius in each instance is broader than the epiphysis.

He did not think that his parents or any of their relatives were similarly affected. One son had the disease, but three other children were unaffected.

Examination revealed a well-nourished, well-developed muscular white man, weight 200 pounds, 5 feet 5 inches in height. He had a waddling gait and knock knees (Fig. 9). The arms were carried in marked pronation with a varus deformity of the elbows. Multiple large exostoses were found on the entire skeleton except the head and the spine. The ribs and scapulae are involved as well as the long bones of the extremities. The largest mass was found attached to the mesial side of the upper extremity of the right humerus, interfering with complete adduction.

Wassermann and precipitin tests were negative. Erythrocytes numbered 4,675,000, the hemoglobin estimation was 80 per cent and urinalysis was negative.

Fig. 9.—Case 4. This patient, the father of patient described in Case 3, has dyschondroplasia of the hereditary deforming chondrodysplasia type. He has marked varus of both elbows and a dislocation of the head of the radius (Fig. 10). Huge osteoma at the upper end of the right humerus interferes with the adduction of the arm (Fig. 11). Note the valgus deformity of the knees, which is a frequent finding. Multiple exostoses not clearly shown were found in the region of the knees (Fig. 12). (From Mahorner: South. Surgeon, 1936.)

Fig. 10.—Case 4. An excellent example of arrowhead deformity as seen at the distal end of the left ulna. The tip is pointed and the metaphysis is broad. The radius is relatively much longer than the ulna. It shows a dislocation at its upper end. Note the peculiar shape of the carpal bones. (From Mahorner: South. Surgeon, 1936.)

*Roentgenograms.*—Left forearm, wrist, and elbow: The radius is markedly bowed, relatively much longer than the ulna, and the head of the radius is dislocated (Fig. 10). The inferior articular surface of the radius faces toward the ulna. The interosseous space is wider than normal, and the lower end of the radius is widely separated from the ulna. The broadness of the metaphyses of the radius and ulna extends for an abnormal distance up the shaft. There is incomplete ossification of the metaphyses and several small exostoses on all metaphyses of each bone, more at the lower ends of the radius and ulna. The lower end of the ulna shows a most characteristic "arrowhead" deformity. It is pointed at the tip and broad in the metaphysis. Changes in the right radius and ulna are similar but not quite as marked. Dislocation of the head of the radius is plainly visible in the x-ray film, and another false head has formed below the true head.

Upper end of the humeri: The broad metaphyses extend one-third of the distance of the shaft. The cortex is thin in this area, and there is definite stippling

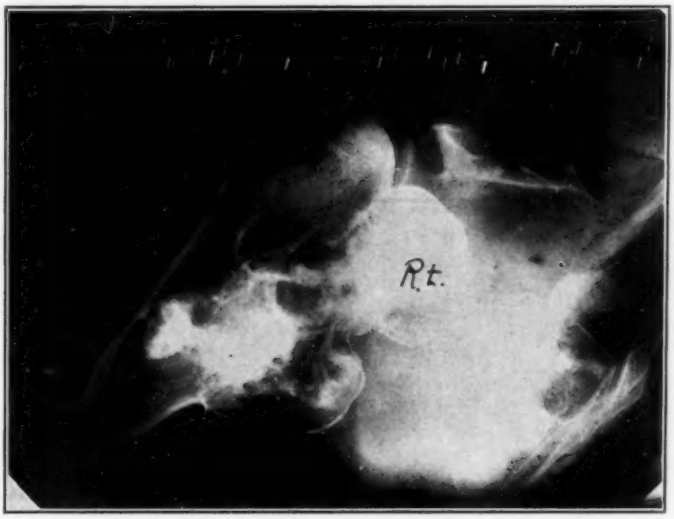



Fig. 11.—Case 4, showing the huge osteoma at the upper end of the humerus which prevented adduction of the arm.

and a suggestion of longitudinal striation on the left. On the right the calcification has been irregular, in some areas patchy, and in some the striation tends to be transverse. A large osteoma occupies the medial side of the upper third of the right humerus (Fig. 11). Its broad base and diameter are approximately the same as that of the broad metaphysis. A thin cortex and irregular calcification are likewise evident here.

Tibias and fibulas: There is a beautiful example of fusion of both fibulas and tibias at both the superior and inferior ends (Fig. 12). This bony fusion is present over a much larger area than the usual area of contact. The interosseous space is broader than normal. The metaphyses are broad with the usual thin cortex and irregular calcification. The middle shafts of the fibulas seem to be relatively larger, that of the tibias relatively smaller than normal so that the appearance suggests that both bones, instead of the tibia alone, are bearing the weight. This is actually true because of the deviation (valgus) at the ankle joint. The inferior articular surface of the tibia is not transverse to the long axis of the bone, but is deviated

from the normal 45 degrees so that the joint surface faces outward and downward. The fibula is short, but it is not because of this short fibula that valgus is present as some authors[4, 28] maintain. The valgus is due to deviation of the articular surface of the tibia, and the head of the fibula bears some weight from the upturned outer surface of the astragalus.

CASE 5.—A. R., female, aged thirty-four years, had a roentgenogram taken of both knees because of pain and swelling in the left with tenderness at the outer anterior aspect of the superior articular surface of the tibia, which pain was occasioned by a fall. There was no history of bone dystrophies in the family. The patient quickly recovered with a knee support and rest, but, though the roentgenogram showed no evidence of injury to the bone, it did disclose slightly prolonged metaphyses of the tibia and a pointed exostosis jutting downward from each metaphysis. X-ray plates of the wrist, which were taken with the expectation of possibly finding further evidence of dyschondroplasia, were negative.

Fig. 12.—Case 4. There is fusion of each tibia and fibula at the upper and lower ends. The ankle joint is deviated outward, throwing some of the weight of the astragalus directly on the fibula. The shaft of the fibula is relatively broad compared with that of the tibia, which undoubtedly is due to the fact that the fibula has become a true weight-bearing bone. The dotted lines shown on the roentgenograms of the knees indicate the limits through which ossification proceeded in the growth of bone. Absorption of part of this to form the diaphysis has occurred, but the exostoses remaining suggest that the partial failure of diaphysation has resulted in abnormal bony prominences. On the left, however, the projection of that part of the exostosis beyond the dotted line cannot be accounted for by failure of diaphysation but must have resulted from abnormal growth. (From Mahorner: South. Surgeon, 1936.)

CASE 6.— The author has had one additional case, the record of which is lost. The child had a fractured arm and in taking roentgenograms of the break, a peculiar condition was noted—failure of development of the distal end of the ulna resembling the appearance of the so-called "arrowhead deformity" found not infrequently in the hereditary deforming chondrodysplastic type. The distal ulnar epiphysis was poorly formed and the end pointed with the broad metaphysis and incomplete calcification. There were no other lesions. No other member of the family was known to be affected. This particular case, undoubtedly an abortive type of the condition, would probably have remained undiscovered had it not been for the fracture. It indicates how the disease may remain clinically latent and thus mask its hereditary basis.

## CLINICAL CHARACTERISTICS

*Age of Onset.*—The first manifestations of dyschondroplasia are generally noted by the parents in infancy or early childhood. The age of appearance was noted by Honeij[34] in 66 cases reported in the literature: At birth, 1 case; birth to five years, 12 cases; five to ten years, 7; ten to fifteen years, 4; fifteen to twenty years, 2; after twenty years, 1. The remaining cases gave no information as to the time of first manifestations.

Davis[4] says that Dreicher in 1889 and Reulos in 1885 described cases that were noted at birth. As a general rule, the affection is first noticed between eighteen months and five years of age, and sometimes later in life; some cases, being latent, are discovered only accidentally. Undoubtedly roentgenograms at birth would disclose indications of the disease in cases that are not clinically manifest until later.

*Sex.*—Males are more often affected than females. Reinecke[1] reports the ratio as 3 to 1, Ehrenfried[13] as 5 to 2. There is no adequate explanation for this discrepancy which runs so true to form in different series. Trauma has been suggested as a factor.

*Objective Findings.*—The earliest manifestations are most frequently hard, irregular nodules on the skeleton in the region of the epiphysis of long bones. However, a parent may notice that the extremities of one side are shorter than those of the other (Ollier's type). Actual deformities of the bones may be observed, but as a rule these are not apparent as an initial manifestation. The abnormal bony prominences increase slowly in size, and others may appear. The areas of predilection are the juxtaepiphyseal regions, especially of the arms and legs. Clinical examination and knowledge may suggest it, but the roentgenogram later confirms the fact that these bony projections are on the diaphyseal side of the epiphyseal cartilage and that they are more inclined to be large and more numerous in the metaphyses, which have undergone the most rapid growth: thus, at the lower end of the femur, at the upper end of the tibia, lower end of radius and ulna, upper end of the humerus, lower end of the tibia and fibula, and the region of the elbow joints. The ribs are common sites, especially posteriorly near the tuberosities. Small exostoses occur frequently on the phalanges. The carpal bones are rarely the seat of exostoses, but they may be unequal in relative size[34] (see also Case 1 in this paper). Relative unequality has been observed in the phalanges (Cases 1 and 3). The os innominatum is an infrequent location for exostoses, and the bones of the head and spine are less frequent locations. Osteochondromas do occur, even though rarely, on the skull and spine and even on

bones of the face (Ochsner and Rothstein[35]). The patient in Case 1 reported herein had an enlargement, evidently a chondroma, on the septal cartilage of the nose.

Shortness of stature is a common finding. In the Ollier type of dyschondroplasia the extremities of one side may be considerably shorter than those of the other. Hunter and Wiles[17] in 1935 collected twenty-nine unilateral cases with facial asymmetry in six. Ehrenfried[13] considers shortness of stature a common finding in the hereditary deforming dyschondroplasia type, and all the affected members of the family in Case 1 reported here were short—5 feet, 1 inch to 5 feet, 2 inches, while the unaffected members were invariably taller.

Certain deformities other than the bony prominences are likely to occur, and these are due to a relative deficiency in growth of some of the bones and irregularities in growth along an epiphyseal line. Some of these findings, while not constant, are quite characteristic, and while better appreciated in the roentgenograms they may be expressed clinically. A varus deformity may be present at the elbow (according to Keith[12] in one-third of the cases) and the head of the radius may be dislocated, the radius longer than the ulna, with ulnar deviation of the hand. The opposite relationship, i.e., ulna longer than radius, is far less common but does occur. Various abnormal curves may be present in the bones. A valgus deformity of the knees with knock knees is not uncommon, and valgus deformity of the ankle joints with the external malleolus much higher than the internal occurs. Pes valgus is not entirely explained on the basis of short fibula, as was suggested by Davis[4] and Ehrenfried,[25] but to a true deviation of the lower articular surface of the tibia (Fig. 12), which is occasioned by the unequal growth along the epiphyseal line, the inner part of the epiphysis growing faster than the outer end. Pes planus is a common finding because of the valgus deformity of ankle.

These individuals are of normal mentality and normal muscular development. They are not prone to become athletic like achondroplastic dwarfs and are not weak like the pitiful patients with Morquio's disease (Morquio,[36] Ruggles,[37] and Meyer and Brennemann[38]). They are not of an abnormally retiring disposition and are more amused by than ashamed of their malady, but are fearful of their offspring's being similarly affected. Calcium content of the blood is normal.[34]

At maturity, the exostoses cease to grow, and deformities do not increase. The disease clinically remains stationary except in rare instances, in which exostoses may increase or decrease in size or rarer instances when they might appear for the first time (Honeij,[34] Davis[4]).

*Roentgenologic Characteristics.*—There are certain features revealed in the x-ray films in the affections which the author, among others,

chooses to group under the heading "dyschondroplasia," which justifies the classification of all of them under the same name: The *location* of the affection, most marked in the metaphyses of long bones in which most rapid growth is occurring; second, the *age period*, youth and adolescence in which the abnormal findings are most marked. In adult life healing tends to occur by more uniformity of ossification. Third, *irregularity and incompleteness of ossification* near the epiphyses, indicated by clear areas, streaking, striation or stippling of the metaphyses. Fourth, *long metaphyses*, i.e., the broadness of the metaphyses extending for an abnormal distance on the diaphysis and not shading in the normal distance into the smaller diametered diaphyses. This indicates incomplete resorption (tubulation) or conversion of the metaphysis into the diaphysis, a process which I choose to name diaphysation. Fifth, *exostoses*, which may be a prominent clinical finding, but in the x-ray pictures their existence is shown to be not the fundamental process in the disease. Certain cases have but few small exostoses less striking than other roentgenologic characteristics that indicate a developmental defect of bone affecting mainly metaphyses which have undergone the fastest growth. In each type of dyschondroplasia there is a different degree of prominence of the various characteristic features of the disease.

In the hereditary deforming chondrodysplasia type practically all of these features are pronounced. The metaphyses are broad, and incomplete ossification results in diffuse osteoporotic areas. Irregular calcification results in appearance of longitudinal striation and stippled areas. Striped metaphyses are not so regular or so marked as in the Voorhoeve type, nor are the stippled areas so large or so pronounced as in the Albers-Schönberg type. Osteochondromas may be numerous and large. Both sides of the skeleton are affected, and clear, punched-out areas in the phalanges and metacarpals suggest enchondromas. Shortness of stature seems to be a constant finding.

In the Ollier type of dyschondroplasia the affection is usually unilateral with the affected extremities much shorter than the opposite side. Heredity is infrequently proved. There are longitudinal striations of the metaphysis and even stippling. Failure of diaphysation (process involved in transformation of the broad metaphysis into the narrow shaft) has been more gradual, less abrupt, than in the hereditary deforming chondrodysplasia type of dyschondroplasia. Asymmetry of the face may be found.[17, 32, 34] Osteochondromas are less numerous, and on the whole, smaller. All features are found in both the Ollier type and the hereditary deforming chondrodysplasia type, but some characteristics are more pronounced in one type, some in another. It is not entirely a difference in intensity which distinguishes the two types. In Case 5 reported here, for example, the manifestations of dyschondroplasia are minimal, clinically latent, the

failure of diaphysation and small exostoses discovered by x-ray being the only features to distinguish it in the thirty-four-year-old patient.

In Voorhoeve's type the predominant finding is the peculiar insufficiency of calcification in the metaphyses with a pattern so regular that broad stripes caused by zones of deficient and more normal calcification result. The failure of diaphysation and exostoses are not so prominent as in the two preceding types.

In Albers-Schönberg's case[28] the small exostoses and slight tendency to retarded diaphysation are insignificant findings compared with the dense areas of increased calcification. This characteristic of involvement of the epiphyses, especially prominent in this type, is also found to a less extent in the Voorhoeve type and in the hereditary deforming chondrodysplasia type of dyschondroplasia in maturity. One of the most unexpected findings in Albers-Schönberg's[28] case is that the equality of stippling is as pronounced in the epiphyses as in the diaphyses.

The x-ray confirms many of the clinical impressions besides disclosing other characteristics of the disease. The head of the radius may be dislocated and the varus deformity of the elbow is seen to be due to relative shortness of the ulna, the distal epiphysis of which frequently shows various degrees of failure in development and growth. The radius is not invariably longer than the ulna. Sometimes the radius is shorter than the ulna, a condition I have seen, but this is extremely rare. The lower end of the ulna may be pointed with the portion of the bone just proximal to this broad, even broader than normal, incompletely ossified, and converging into the narrower, more normally ossified diaphysis. This particular deformity is called "arrowhead" and is characteristic of the disease. The radius and ulna may be widely separated due to exostoses. Synostoses may occur and frequently exostoses so prominent as to interfere with rotation of the forearm. A false joint more proximal than the distal radio-ulnar may form between the two bones. Ulnar deviation of the hand may result from the short ulna and ulna deviation of the distal articular surface of the radius.

Very characteristic changes also occur in the tibia and fibula. The knock knees frequently noticed clinically are found in the roentgenograms to be due to curves in the tibias and fibulas. These curves, most frequently concave outward, are at the upper and lower ends of the bones (Case 4) and are produced by irregular growth along the epiphyseal lines. The reason becomes more apparent when we view the roentgenograms in Case 1 (Figs. 2 and 4), and in certain instances the epiphyses are not normal in contour but are wavy in outline. The fibula may be shorter than normal, and the inferior articular surface of the tibia may be not at right angles to the longitudinal

axis of the shaft but may show marked outward deviation, throwing the foot into a valgus position with the outer superior margin of the astragalus pointing directly up between the tibia and fibula and some of the weight of the body being transmitted directly through the fibula on to the outer surface of the astragalus (Fig. 12). The shaft of the fibula then bearing weight shows the evidence of increased function by becoming thicker and more robust than normal. The tibia and fibula may fuse together at their upper and lower ends, and the two bones may be more widely separated than normal because apparently of exostoses pushing them apart.

Though the bones of the head and face and vertebral column are infrequently affected by the disease, they may show exostoses[35] and in Case 1 reported herein the skull showed irregular calcification characterized by a fine mottling. This appearance has not been previously described. According to Ehrenfried[13, 25] and Weinstein and Cotell,[39] the disease does not affect membranous bone. This assertion would not seem to be correct, but it is so that the membranous bones show little evidence of the disease and frequently show none. This is probably due to the fact that the disturbance is more marked where growth is occurring fastest.

Carpal and tarsal bones occasionally show evidence of the disease by irregularity in calcification[29, 30, 34] (and Cases 1 and 3 reported here). The relative sizes of the carpal bones may be disturbed[34] (and Cases 1 and 3). Inequality of the metacarpals is seen in the roentgenograms in Cases 1 and 3. This finding has already been recorded by Honeij.[34]

In the Ollier type of dyschondroplasia the phalanges frequently show clear areas which Ollier[8] has shown to be masses of cartilage cells (enchondromas). It is questionable, however, whether all clear areas in the bones are cartilage. This certainly has not been proved because biopsy specimens are very infrequent. The author believes because the subcortical areas of the osteochondromas do not contain cartilage (Fig. 5) that such clear areas as are shown in the upper end of the humerus in Case 4 are mainly filled with fat.

Osteochondromas affect mainly the juxtaepiphyseal region of long bones, and a peculiar finding is that the apex of these always points away from the nearest epiphysis. The author has studied x-ray films carefully to find an exception to this rule and to see if the exostoses are always directed toward muscle pull. On the head of the fibula, for example, the pull of the attached muscle is up and yet the exostoses point downward. No definite exception has been found to the rule and such uniformity of direction speaks in some measure for localized failure of diaphysation as at least an initial cause of the

exostoses (v.i.). The cortex of exostoses sometimes consists of cartilage, sometimes of bone. As maturity advances, ossification becomes more complete, and all osteochondromas tend to become exostoses.

*Etiology, Pathogenesis, and Pathology.*—Some observers have maintained that a relationship exists between multiple exostoses and rickets.[1, 22] Ritter[40] found a small thyroid in the affected members of an exostotic family. It is maintained by Dwyer[9] and White[41] that a definite relationship exists between achondroplasia and dyschondroplasia. Ehrenfried[13, 25] and others have firmly established a hereditary basis in a large percentage of the cases. In 236 cases collected by Ehrenfried,[13] heredity was demonstrated in 176. It was not found in 18, and in the remaining 42 heredity was uncertain or not mentioned. In 3 of the 6 cases reported here a familial basis was established. Two of the remaining were clinically latent cases. Such cases may explain the difficulty of proving heredity in certain instances. In fact, so high is the percentage of cases with proved familial background that a negative history in a preceding generation not actually shown to be free of the disease by x-ray may be accepted with some doubt. Bentzon[31] attempted to prove experimentally that the sympathetic system was at fault. He hypothesized that there was vasodilatation. His paper frequently quoted in the literature is far from convincing, and even he, after detailed experimental work in which he attempted to destroy the sympathetic system by cauterization and found no changes in the bones and in other experiments in which he attempted to destroy the vasoconstrictor nerves by injecting alcohol around the nutrient artery to the tibia with the result that transient osteoporosis occurred in 1 out of 6 cases, did not think that he had definitely proved his hypothesis. Richard, Dupuis, Roederer, and Froyez[16] do not believe Bentzon produced the disease. His roentgenograms and experiments are certainly not convincing.

Jansen[26] believes that the sympathetics are at fault but thinks it is a vasoconstriction rather than a vasodilatation. Freund[32] is of a similar opinion. The theory of sympathetic disturbance has insufficient evidence for its acceptance. The changes in the bone in dyschondroplasia are such that what we commonly find from even long-standing vasoconstriction or vasodilatation are not comparable. There is no evidence of soft tissue vascular disturbance and a contralateral case such as was reported by Molin is unexplained by such a theory. All of which would necessitate the assumption that there are multiple peripheral selected foci of action instead of a disturbance in the central sympathetic system, which necessary supposition makes the theory less acceptable. Bone grows in length at the diaphyseal side of the epiphyseal cartilage. Arthur Keith[12] states that John Hunter realized

not only longitudinal growth but also resorption of the broad metaphysis must occur to form the narrower diametered diaphysis. Keith elaborated this hypothesis in relation to dyschondroplasia which he chose to call "diaphyseal aclasia." He proposed the theory in explanation of dyschondroplasia that the epiphyseal plate grew faster than the periosteum covering it and that the cartilage was left without a limiting membrane, permitting the formation of exostoses. Furthermore, he presumed that tubulation or resorption of the broad metaphysis was delayed and that ossification was incomplete. Jansen[26] further elaborated this theory and reasonably explains the development of many of the features of dyschondroplasia. He states that no less than six, probably more, processes are involved in the development of bone and that any of these may be retarded or hastened. The processes he names are resorption, tubulation (diaphysation), cancellation, cell division, cell enlargement, and cell differentiation.

Jansen[26] thinks retardation of cell division accounts for irregularity (waviness) of the epiphyseal line. Local retardation of tubulation results in exostoses (Fig. 13) and complete retardation of cell division results in achondroplasia. His explanation is the most lucid description of the pathogenesis. But it doesn't explain all exostoses, certainly not those that project farther out from the shaft than the widest limits of the bone in its development. Only abnormal growth can explain such (Fig. 12).

In studying sections from the large osteochondroma removed from the femur in Case 1, the author was struck with the lack of any semblance of calcification of cartilaginous matrix. When bone grows at the epiphyseal line, the metaphyseal side of the cartilaginous plate made up of large cartilage cells and a cartilaginous matrix shows evidence of beginning calcification, forming the groundwork for the invasion of osteoblasts and the production of bone. In precartilaginous bone also in the embryo the earliest transition of the cartilaginous anlage into bone is the appearance of calcium in the matrix of deeper layers between the more mature cartilage cells. Then a process which is the result of osteoblasts and osteoclasts, using the calcified cartilaginous matrix to construct bony trabeculae, converts the preformed, partially calcified cartilage into true bone. Exactly what takes place at the epiphyseal line in these cases of dyschondroplasia, it has been the privilege of few to observe, but, if we presume that the cortex of the osteochondroma is analogous to the true cortex of bone, we see a failure of a fundamental process in these cases, far earlier processes than diaphysation; i.e., a failure of calcification of cartilaginous matrix and a failure of osteoblasts to appear in adequate number and with sufficient activity from the marrow cavity and from the osteogenic layer of the periosteum. Except for lack of calcium precipitated in

these cartilaginous exostoses, probably every other factor is present for the formation of bone, in which instance the normal sequence may follow with no more insufficiently ossified areas, no exostoses. This failure of preliminary ossification of cartilage, however, does not alone

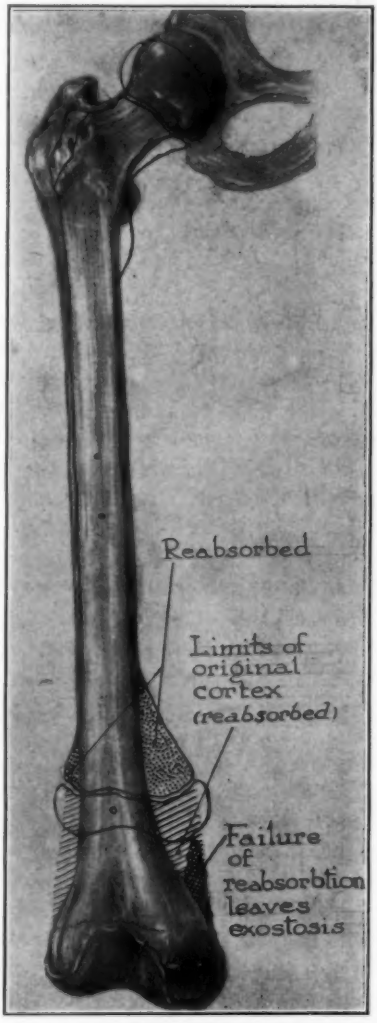



Fig. 13.—Diagrammatic representation of growth of femur. The two dots in the center of the bones do not change relationship with growth, but the circles in the epiphysis move away from the dots in the central portion. The dotted and shaded areas indicate the limits through which the bone develops in the adolescent to adult period. It is in this area of rapid growth that most changes occur in dyschondroplasia. Reabsorption normally results in diaphysis becoming more narrow than the metaphysis. Partial failure of this process (diaphysation) results in exostoses; complete failure results in broad metaphyses.

explain the whole process because it is certainly not called into question in the lack of longitudinal growth and the failure of development in certain cases of the terminal ends of the ulna.

The cause of the disease is obscure. Various theories have been announced: Thyroid deficiency, rickets, fetal rests,[22] sympathetic imbalance, vasoconstriction and vasodilatation influence,[26, 32, 33] heredity,[13, 25] and acquired transmissible characteristics from repeated fractures.[3, 10] In considering the acceptability of these it is immediately apparent that the capriciousness with which the disease affects bones, its occasional unilaterality, or selection of even one extremity, is evidence against a cause or a deficiency circulating in the blood to reach in comparatively the same intensity all the extremities. The question of localization again, together with absence of other concomitant evidence to be expected and together with the incongruities of the disease picture with our present knowledge of the effects of hyperemia or ischemia on bone, is sufficient for withholding acceptance of theories of sympathetic imbalance. Our only reasonable explanation of the cause of the disease today is something in the cell, a deficient anlage. This is more tenable in those cases that are definitely proved familial, but is a less satisfying explanation for the sporadic case. Perhaps a localized deficiency, phosphatase shortage, or some analogous explanation will remove this condition from the category in which the etiology is unknown.

*Prognosis* for life is excellent. Few patients with the disease die because of it. At the end of adolescence, though as a rule no retrocession in the already developed deformities takes place, the condition becomes arrested. No new osteochondromas occur, no new deformities, and roentgenologically ossification apparently progresses toward the normal. Occasionally, though rarely, the pressure of an exostosis arising from the vertebral column results in pressure on the spinal cord.[35] Aneurysms may develop from pressure of an exostosis, or nerve paralysis (see Chart 1 for relatives of patient in Case 1). Infrequent are such complications. More common is limitation of motion in joints; very common is interference with rotation of forearm. Fractures are infrequent.

*Treatment.*—Measures to stop the disease in the progressive stage are of no avail and are not found recorded. The theories of etiology other than heredity have not been sufficiently credited even by their sponsors, apparently, to have evoked a trial for correction of thyroid imbalance or sympathetic disturbance. Thymus extract has been administered in osteogenesis imperfecta with beneficial effects on calcification.[42] Though not entirely analogous, it is possible that it may hasten ossification in this condition. Surgery must be frequently employed to remove osteochondromas which because of their size either

become prominently unsightly or interfere with function, osseous, nerve, or vascular. However, it is not necessary to employ it indiscriminately to remove the larger exostoses, as was done by one author.[9] The dissection of the surrounding tissues should be extracapsular to insure against recurrence by leaving some of the cortical tissue behind. In dressing the wound a moist sea sponge or rubber bath sponge has the proper resiliency for compressing the tissues and avoiding dead space.

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# DIFFERENTIAL DIAGNOSIS OF POLIOMYELITIS

## With Report of a Case of Diffuse Sarcomatosis of the Meninges Suspected to Be Poliomyelitis

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THE diagnosis of certain communicable diseases offers no particular difficulty to the practicing physician. For the past several years the initial diagnoses of patients sent to the Herman Kiefer Hospital with scarlet fever, erysipelas, measles, chickenpox, and whooping cough were substantiated in more than 90 per cent of cases. On the other hand, the diagnosis of a few communicable diseases is not so readily made. Patients sent to the hospital with an initial diagnosis of typhoid fever were verified as having this disease in only 51.9 per cent of cases during a five-year period. Poliomyelitis is also a disease the diagnosis of which may be attended with considerable difficulty. During the period 1927 to 1935, inclusive, 790 patients were admitted to the hospital with the diagnosis of poliomyelitis. Of these, the initial diagnosis was confirmed in 445, or 56.3 per cent.

The difficulty in differentiating poliomyelitis from general systemic or central nervous system infections is considerable because the diagnosis of the disease is at present not limited to frankly paralytic cases. A decade or two ago the diagnosis of poliomyelitis was made only when paralysis occurred. The diagnosis of nonparalytic poliomyelitis is now possible because of improved clinical and laboratory procedures. A careful study of familial contacts to known cases frequently substantiates the impression that so-called abortive cases do occur.

In the first or systemic phase, poliomyelitis differs in no important essential from the onset of the average acute general infection. It is not surprising, therefore, that in many instances patients apparently suffering from an infectious disease should be referred to the hospital with the diagnosis of poliomyelitis when this disease is prevalent. It is far better to err in this manner than to have omitted consideration of the disease, and physicians are to be commended for being alert to the possibility of poliomyelitis.

Table I gives the final diagnosis of cases referred to the Herman Kiefer Hospital as poliomyelitis for the period, 1927-1935, inclusive.

The table lists seventy-nine conditions encountered in patients referred to the hospital with the diagnosis of poliomyelitis. Upper respiratory infections accounted for the largest number of cases which by clinical and spinal fluid findings failed of verification. In 74 instances the

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TABLE I

FINAL DIAGNOSIS OF 790 CASES REFERRED TO THE HOSPITAL AS POLIOMYELITIS, 1927-1935

| DISEASE | NUMBER OF CASES | PER CENT OF TOTAL |
|---|---|---|
| Poliomyelitis | 445 | 56.3 |
| Nasopharyngitis | 74 | 9.4 |
| Influenza | 26 | 3.3 |
| Meningitis, tuberculous | 19 | 2.4 |
| Rheumatic fever, acute | 19 | 2.4 |
| Tonsillitis, acute follicular | 18 | 2.3 |
| Meningitis, meningococcus | 17 | 2.2 |
| Gastroenteritis, acute | 16 | 2.0 |
| Otitis media, acute | 15 | 1.9 |
| Pneumonia, lobar | 12 | 1.5 |
| Pneumonia, bronchial | 10 | 1.3 |
| Encephalitis | 8 | 1.0 |
| Scarlet fever | 6 | 0.8 |
| Serum sickness | 5 | 0.6 |
| Appendicitis | 5 | 0.6 |
| Dysentery, bacillary | 4 | 0.5 |
| Osteomyelitis | 4 | 0.5 |
| Pyelitis | 4 | 0.5 |
| Meningitis, streptococcus | 3 | |
| Myelitis, transverse | 3 | |
| Typhoid fever | 3 | |
| Endocarditis, acute bacterial | 2 | |
| Epiphysitis, acute | 2 | |
| Exanthem subitum | 2 | |
| Hysteria | 2 | |
| Landry's paralysis, nonpoliomyelitic | 2 | |
| Meningitis, Pfeiffer bacillus | 2 | |
| Myositis | 2 | |
| Nephritis, acute | 2 | |
| No disease | 2 | |
| Paraplegia, spastic, old | 2 | |
| Peripheral neuritis—Bell's palsy | 2 | |
| Poliomyelitis and whooping cough | 2 | |
| Sinusitis, acute | 2 | |
| Syphilis, congenital | 2 | |
| Tuberculosis, acute, miliary | 2 | |
| Whooping cough | 2 | |
| Abscess, cervical lymph node | 1 | |
| Abscess, foot | 1 | |
| Abscess, inguinal | 1 | |
| Abscess, intraspinal | 1 | |
| Alcoholic neuritis | 1 | |
| Aortitis, chronic | 1 | |
| Asthma, bronchial | 1 | |
| Bronchitis, acute | 1 | |
| Bronchitis, chronic | 1 | |
| Cardiovascular disease | 1 | |
| Cerebral thrombosis | 1 | |
| Chorea | 1 | |
| Colitis, mucous | 1 | |
| Endocarditis, subacute bacterial | 1 | |
| Erysipelas | 1 | |
| Fracture, skull | 1 | |
| Heart disease, congenital | 1 | |
| Heat prostration | 1 | |
| Hemangioma of meninges and brain | 1 | |
| Hemorrhage, cerebral, hemiplegia | 1 | |
| Hemorrhage, intracranial, of newborn | 1 | |
| Jaundice, acute, catarrhal | 1 | |
| Lymphatic leucemia | 1 | |
| Malnutrition | 1 | |
| Mastoiditis, chronic suppurative | 1 | |
| Measles | 1 | |
| Meningitis, pneumococcic | 1 | |
| Meningitis, type undetermined | 1 | |
| Migraine | 1 | |
| Mumps | 1 | |
| Paratyphoid fever B | 1 | |
| Peritonitis, pneumococcus | 1 | |
| Rickets | 1 | |
| Sarcoma, spinal cord | 1 | |
| Septic sore throat | 1 | |
| Septicemia | 1 | |
| Status epilepticus | 1 | |
| Syphilis, cerebrospinal | 1 | |
| Tetanus | 1 | |
| Traumatic injury of hip | 1 | |
| Traumatic injury of knee | 1 | |
| Vaccination, active | 1 | |
| Totals | 790 | 99.7 |

diagnosis of nasopharyngitis was made. This condition may be a symptom of early poliomyelitis. Infections of the brain and spinal cord, taken as a group, were responsible for 73 cases. Pneumonia accounted for 22 cases. Acute rheumatic fever occurred 19 times in this series. The remainder of the list includes conditions which occurred with less frequency and shows a wide range of possibilities of error in making a diagnosis of poliomyelitis.

The diagnosis of conditions listed in the table was made clinically, aided by laboratory findings. At the present time animal protection tests are not feasible as a routine procedure for verification of the diagnosis of poliomyelitis in suspected cases. Latitude in the inclusion of so-called abortive and nonparalytic cases of poliomyelitis, which might have been eliminated as the result of animal tests, is probably offset by the exclusion of cases with upper respiratory infections in which no history of contact with a known case is given, but which might have been verified as poliomyelitis by animal tests.

In general, certain clinical findings discount the importance of the consideration of poliomyelitis as the diagnosis in a suspected case. Briefly, they are as follows:

1. *Irrationality or Coma.*—These states are uncommon in poliomyelitis, but one or the other is frequently seen in meningitis of all types, cerebral accidents, cerebral manifestations of acute nephritis, or diabetes.

2. *Marked temperature elevation,* with pronounced fluctuations of the septic type. Temperature is generally moderately elevated in poliomyelitis. Septic temperatures suggest pyelitis, otitis media, typhoid fever, undulant fever, tularemia, malaria, or sepsis.

3. *Convulsions.*—This phenomenon may occur in poliomyelitis but usually accompanies the acute onset of a severe infection in infants and small children. Consideration must be given to tetanus, pneumonia, tetany, status epilepticus, an acid-base imbalance, or an acute gastrointestinal disturbance.

4. *Meningismus.*—This condition is generally a temporary meningeal irritation which may occur during the course of acute infectious diseases. Symptoms are, as a rule, less severe than those of a purulent meningitis, and characteristically there is a rapid recession of symptoms following relief of pressure by lumbar puncture. The spinal fluid cell count is low, and no organisms are present.

5. *Severe Pain or Swelling of Affected Extremities.*—Hyperesthesia is common in the early central nervous system phase of poliomyelitis, but pain is unusual. Swelling of an affected part is not caused by this infection. The presence of one or both of the conditions should call to mind osteomyelitis, epiphysitis, bursitis, suppurative arthritis, acute rheumatic fever, myositis, or abscess of soft parts.

6. *Cervical Lymphadenitis.*—When noticeable and painful enlargement of the cervical lymph nodes is present, the diagnosis is likely to be one of the following infections: diphtheria, scarlet fever, septic sore throat, infectious mononucleosis, peritonsillar or retropharyngeal abscess, tonsillitis, tuberculous lymphadenitis, leucemia, or serum sickness.

7. *Abdominal Tenderness.*—This sign may be elicited during the systemic phase of poliomyelitis and is generally attributed to the effect of the virus on the mesenteric lymph nodes, Peyer's patches, and the spleen.

Generalized abdominal tenderness is a common accompaniment of typhoid and paratyphoid fever, dysentery, colitis, or peritonitis. Localized tenderness should direct attention to the appendix, gallbladder, kidney, or uterine adnexae and occasionally to a diaphragmatic pleurisy or beginning lobar pneumonia.

8. *A Prolonged Illness With Subsequent Paralysis.*—Weakness or paralysis usually develops within a week of the onset of poliomyelitis. The late occurrence of paralysis is commonly seen in diphtheria.

In spite of careful attempts to avoid pitfalls in the diagnosis of poliomyelitis, an occasional bizarre condition presents itself which is provocative of a diagnosis wide of the mark. Even unusual cases offer clues which, if recognized, would lead to a more accurate diagnosis. Such a case was seen on the service of this hospital during the month of July, when cases of poliomyelitis normally begin to be reported. The history of onset, the findings upon physical examination, and the subsequent clinical course of the illness drew our attention sharply to the consideration of poliomyelitis as the diagnosis in this instance. The history and the clinical course of the case were as follows:

The patient was an eleven-year-old white male, who was admitted to Herman Kiefer Hospital on July 17, 1935, with a diagnosis of suspicious poliomyelitis. The boy gave a history of having had scarlet fever several years ago. He was successfully vaccinated against smallpox and diphtheria in 1933. There was no history of tuberculosis in the family. About June 28 the patient jumped from a porch and fell. He did not complain at the time of the fall. On or about July 3 he began to complain of pain in the back and stomach. This complaint was presented at intervals for a week following this date and more frequently at night. The pain was evidently not severe enough to prohibit the patient from going in swimming several times during the interval. On July 8 the patient began to limp on the right foot, and to complain of pain in the right heel. He was taken to a physician a few days later because of increasing and gradual inability to walk. Complete inability to walk occurred on July 15. On July 16 the patient complained of pain in the neck and his physician did a lumbar puncture, in the home, and removed 5 c.c. of apparently xanthochromatic fluid, said to have been under some increase of pressure. The boy was admitted to Herman Kiefer Hospital on the following day with a diagnosis of suspicious poliomyelitis.

*Physical Examination.*—The patient was well developed and well nourished and appeared acutely ill. The skin was negative except for a contusion present on the left leg below the knee. Examination of the eyes, ears, and nose gave negative results. A slight injection of the nasopharyngeal structures was noted. The heart and lungs were negative to percussion and auscultation. The abdomen was tense on palpation in the lower quadrants; dullness to percussion was present above the symphysis pubis. The left testicle was not completely descended. There was flaccid paralysis of the lower extremities and complete anesthesia of the lower half of the body to within 3 inches of the nipple line. Priapism was marked and persistent. Micturition was involuntary and bladder function appeared to be automatic. The biceps and triceps reflexes were hyperactive. The umbilical and cremasteric reflexes and the knee and ankle jerks were absent. The Babinski and Brudzinski signs were negative. The patient had a stiff neck and back.

The temperature, on admission, was 100° F., the pulse rate 110, the respiratory rate 22. The blood count taken on the day of admission showed: red blood cells, 4,530,000; hemoglobin, 80 per cent; white blood cells, 17,500, of which 93 per cent were polymorphonuclear leucocytes and 7 per cent small lymphocytes.

Lumbar puncture was attempted by three members of the staff, but spinal fluid was not obtained. A cisternal puncture was successful and 15 c.c. of clear fluid were removed. Examination of the spinal fluid showed a cell count of 290; globulin, negative; differential count, 50 per cent lymphocytes; Gram stain, no organisms; quantitative sugar determination, 107 mg. per 100 ml. The spinal fluid Kahn was negative.

Roentgenologic examination of the spine revealed no evidence of bone injury or bone disease.

*Subsequent Course.*—There was no evidence of involvement of upper cord or higher brain centers throughout the first hospital day. Examination on the morning after admission showed a loss of sensation up to the nipple line and loss of all movement of both lower and upper extremities. During the morning the patient appeared rather drowsy although he responded to stimulation. A lumbar puncture was attempted and again proved unsuccessful. At a subsequent cisternal puncture 15 c.c. of clear fluid were removed under slight increase of pressure. The cell count was 25; globulin, one-plus; Gram stain, no organisms; quantitative sugar determination, 75 mg. per 100 ml.

About 10:30 A.M. the patient complained of being hungry. At dinner time (11:30 A.M.) he ate well and experienced no difficulty in swallowing. At 12:45 P.M. the patient complained of difficulty in breathing, but cyanosis was not present. During the remainder of the afternoon there were spells of restlessness followed by intervals of drowsiness. On examination at 4:30 P.M. respiratory movements were retarded. Diaphragmatic function did not appear to be impaired, but paralysis of the intercostals was evident. The patient's color became slightly cyanotic, and artificial respiration was resorted to until the patient could be placed in the Drinker respirator. Therapeutic stimulation and hyperventilation in the respirator were of no avail, and the patient died, approximately eighteen hours after admission to the hospital.

## COMMENT

The history and general course of illness in this case were not materially different from those seen in a Landry's type of paralysis in poliomyelitis. There are a few findings which may appear difficult to harmonize with a diagnosis of poliomyelitis: notably, (1) *the history of a fall.* Not infrequently this may be incidental to or possibly serve as the contributing cause of a poliomyelitic infection. (2) *The finding of xanthochromatic fluid.* On an initial lumbar puncture one may encounter bloody fluid due to trauma at the time of the puncture, and this may occur in a frank case of poliomyelitis. However, xanthochromatic fluid should not be present in this disease on an initial lumbar tap. Subsequent lumbar punctures were unsuccessful, but two cisternal punctures showed a colorless fluid. (3) *Sensory paralysis.* Sensory paralysis is possible without motor paralysis and does occur along with motor paralysis in poliomyelitis. The virus may affect not only anterior horn cells, but adjacent nerve cells as well. Edema and congestion may be so pronounced that the spinal cord is unusually firm. Under such circumstances there may be loss of both motor and sensory function.

The history of a fall and the report of xanthochromatic fluid suggested a traumatic myelitis with hemorrhage. Subsequent rapid progression of paralysis seemed to warrant less consideration of this possibility.

With the exception of the appearance of xanthochromatic spinal fluid, the findings mentioned above did not appear to give sufficient weight to seriously call into question the credence of a diagnosis of poliomyelitis, and the patient came to autopsy with this clinical diagnosis. One member of the clinical staff disagreed with the diagnosis of poliomyelitis, although entertaining no definite idea with respect to the pathologic picture.

*Autopsy.*—The autopsy was performed three hours after death. There was marked flaccidity of the muscles, and the body was still warm. A yellowish green contusion, about 3 cm. in diameter and very slightly elevated, was noted on the anterior lateral surface of the left leg about 15 cm. below the knee.

The heart was of proportionately normal size. The right auricle and ventricle were relaxed but not dilated. The left auricle and ventricle were well contracted. The lungs were normally air-containing throughout. The bladder contained about 250 c.c. of clear urine. The subarachnoid spaces contained slightly more than the normal amount of clear fluid. The bony and ligamentous walls of the spinal canal showed no evidence of preexisting injury.

When the spinal dura was exposed, it was seen to be markedly distended, having a maximum lateral diameter of about 16 mm. at the level of the ninth thoracic vertebra, where it appeared to be filled by the greatly swollen spinal cord. Visible through it were dull red and bluish green discolorations of the cord. The swelling extended from the level of the fourth thoracic vertebra to the level of the second lumbar vertebra. At the level of the twelfth thoracic vertebra, the dura was less tense, and there was a dark bluish red discoloration with the appearance of intradural hemorrhage.

Removal of the cord and reflection of the dura revealed the leptomeninges of the lower portion of the lumbar swelling filled with dull red blood completely encircling the cord (Fig. 1). The upper level was fairly well demarcated on the posterior aspect and was more distinct and about half a segment lower on the anterior aspect. The hemorrhage decreased in amount among the nerve trunks of the upper portion of the cauda equina.

About the area of hemorrhage, the normally narrow thoracic portion of the cord was swollen to a maximum lateral diameter of 16 mm. and mottled with bluish green and dull red discolorations of maximum intensity on the posterior surface. On the anterior surface, the blood vessels were engorged. The swelling and discoloration gradually decreased in the upper thoracic portion and disappeared in the cervical swelling.

The picture presented was that of a transverse hemorrhage and the cord changes seen above the hemorrhage were interpreted as ascending degeneration. The finding of hemorrhage substantiated the attending physician's report of xanthochromatic fluid and the swelling of the cord was sufficient to account for the failure to obtain spinal fluid at subsequent lumbar punctures.

In the absence of any injury to the spinal canal, the hemorrhage and degeneration were thought to be of an inflammatory origin and, while recognized as atypical for poliomyelitis, no explanation which rationalized all the findings was offered.

Microscopic examination of sections revealed the true nature of the condition. What had appeared as the swollen spinal cord was a diffuse neoplasm distending the

leptomeningeal spaces and distorting and invading the cord. In the zone of hemorrhage (Fig. 2) are numerous large, thin-walled spaces lined with endothelium and filled with blood which, at low magnification, have the appearance of an angioma.

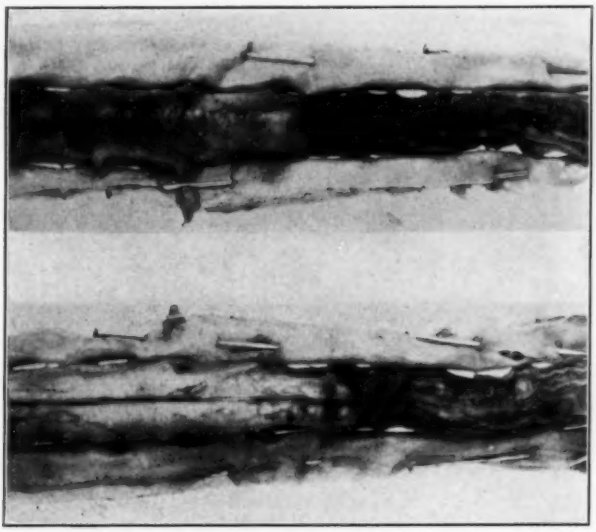

Fig. 1.—Anterior and posterior surfaces of the spinal cord showing hemorrhage in the region of the lumbar enlargement and marked swelling and discoloration of the thoracic cord.

Fig. 2.—Section from the deeply discolored lumbar region showing large angiomatous blood spaces surrounded by tumor cells with hemorrhage.

A few of these spaces contain unorganized thrombi. Around the spaces and the nerve trunks is a loose mat of spindle cells in intimate relation with the adventitia of the blood vessels (Fig. 3). A few round and polyhedral cells are also present, and there are extravasated red blood cells scattered throughout the tissues.

Sections from the region of maximum swelling (Fig. 4) show the tumor mass occupying more than two-thirds of the area of the cross-section of the cylinder with the remnants of the cord in the anterior portion. There was a wedge-shaped mass

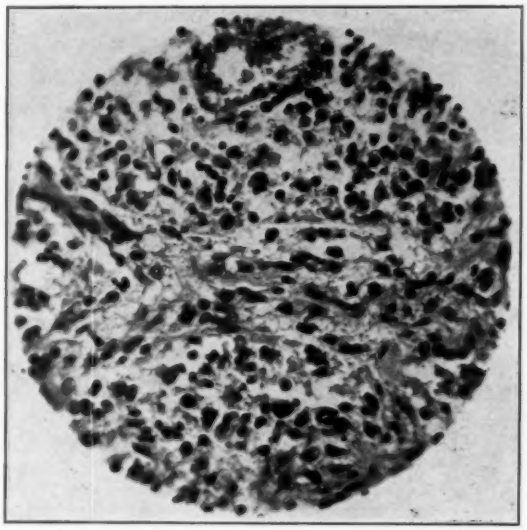

Fig. 3.—Cell character of the tumor in the lumbar cord.

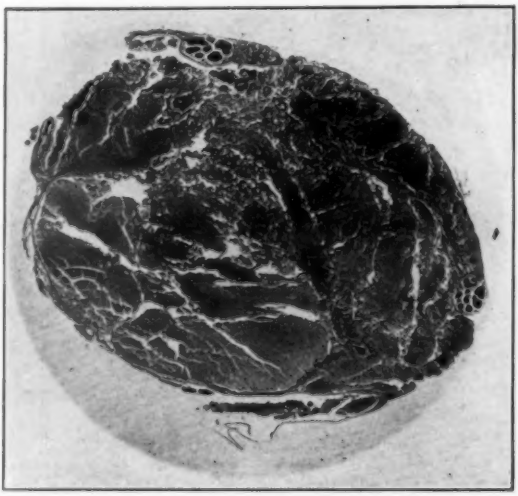

Fig. 4.—Section from the thoracic cord showing that what appears as the swollen spinal cord in Fig. 1 is tumor. The distorted and invaded cord surrounded by tumor can be seen in the anterior portion of the section.

of tumor spreading the posterior median portion of the cord and extensive invasion of the cord tissue by tumor cells. In this region (Fig. 5) the tumor contains many

engorged small blood vessels, and the tumor cells are less differentiated than those around the large blood spaces, and round nuclei are more numerous. In many areas, the nuclei were grouped, suggesting a pseudoalveolar pattern, and large cells are fairly numerous. There were extensive areas of early degenerative changes.

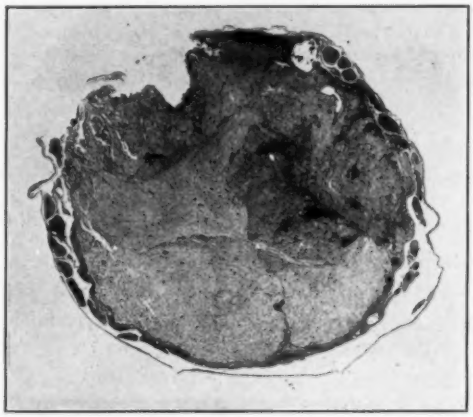

Fig. 5.—Section showing plexus of small blood vessels, a developmental stage intermediate between Figs. 2 and 4.

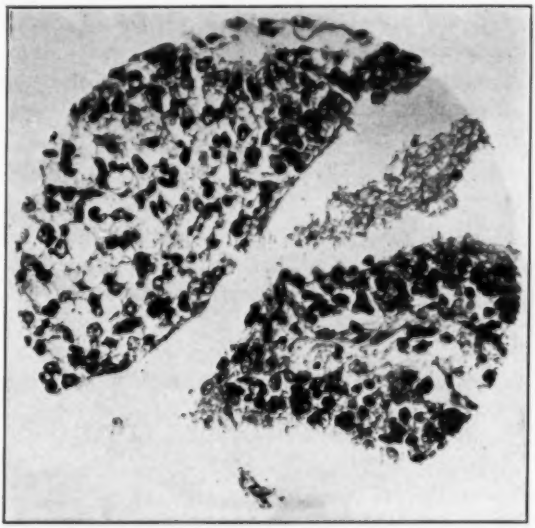

Fig. 6.—Cell character of the tumor in and above the upper thoracic cord.

At higher levels of the cord, its invasion and distortion became less, and the layers of tumor cells on the pia became thinner. Groups of tumor cells were found along the leptomeningeal blood vessels and pia of the medulla, cisterna pontis, and cisterna interpeduncularis and, also, along the attachments of the choroid plexuses of the fourth, third, and lateral ventricles, and a small mass of tumor cells was found in the infundibular recess.

Above the thoracic cord, the tumor consisted of fairly uniform cells with large, slightly oval nuclei having reticulated chromatin, the relatively scanty cytoplasm forming a delicate meshwork (Fig. 6).

An excellent description of this type of tumor is given by Ewing,[1] under the heading, "Diffuse Sarcomatosis of the Meninges." This tumor seems particularly to justify Ewing's statement that the recognition of a specific form of diffuse angioblastic meningeal sarcoma seems warranted.

## DISCUSSION

The finding of xanthochromatic fluid was an important clue to the final diagnosis. The slight consideration this clue was accorded resulted less from lack of appreciation of its importance than from doubt concerning the reliability of its report.

The fall sustained by the boy may have accounted for some or all of the hemorrhage of the cord, but it would seem just as likely that the boy fell because some weakness of the lower extremities was already present. The latter explanation would appear to be more in keeping with the delay which ensued between the fall and the patient's first complaint. Again, progression of paralysis was not so rapid that swimming was impossible several times during the two-week interval between the fall and the seeking of medical aid.

When the extent of the pathologic process is considered, it is amazing that the patient remained apparently symptom-free for so long a period of time. The patient began to limp eleven days before he died, and progression of paralysis did not appear rapid until difficulty in walking occurred. The interval between complete inability to walk and death was three days.

## SUMMARY

The differential diagnosis of poliomyelitis is presented, and a case of diffuse sarcomatosis of the spinal leptomeninges is reported, with a discussion of the diagnostic difficulties encountered.

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# ADRENAL NEUROBLASTOMA IN CHILDREN

## With Report of Two Cases

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IT HAS been known for many years that tumors arise from the medulla of the adrenal gland. In the older literature these were called neurocytomas. Virchow[9] in 1864 recognized that such tumors were associated with the sympathetic nervous system, from which the adrenal medulla is developed and called these tumors gliomas. Marchand[5] in 1880 described a case of tumor of the adrenal medulla which occurred in a child nine months of age and interpreted it as a reproduction of the anlage of the sympathetic nervous system. Pepper[6] in 1901 described a group of cases which he collected from the literature and from his records, in each of which the primary tumor was in the right adrenal. He called these "congenital sarcomas." All of these cases presented similar clinical and pathologic pictures; they occurred in infants; they were very malignant, metastasizing early to the liver but never to the skull or long bones. This group of cases, with others which have occurred since, have been known as the "Pepper type of neuroblastoma."

Hutchinson[2] in 1907 described thirteen cases of primary tumor of the adrenal which he observed or selected from the literature, in which the primary tumor was in the left adrenal medulla. These cases had widespread tumor metastasis in the retroperitoneal lymph glands, skull, and long bones, but no metastasis in the liver. They also showed proptosis and increased intracranial pressure.

Wright[11] in 1910 was one of the first to give a complete histologic description of these tumors and classify them according to their origin. He demonstrated nerve fibers and rosettes, such as are seen in the anlage of the sympathetic nervous system from which the adrenal medulla is developed. He called these tumors neuroblastomas.

Robertson[7] in 1915 correlated the terms used by various writers in classifying tumors of the adrenal medulla. He suggested a classification based on the structural differences, such as sympathoblastoma, ganglioneuroblastoma, ganglioparaganglioneuroblastoma, ganglioglioneuroblastoma.

Scott, Oliver, and Oliver[8] in 1933 made an extensive survey of the literature on tumors of the adrenal medulla. They found 158 cases in the literature and added four of their own. They have accepted the classification of Bailey and Cushing,[12] who in their monograph

"Tumors of the Glioma Group," use the term "sympathoblast" for the primitive pluriopotential cell before it has taken on the characteristics of a unipolar neuroblast. The sympathoblast corresponds to their medulloblast of the central nervous system. The classification they use is based on the dominant cell type:

1. Completely undifferentiated sympathicoblastoma.
   a. Sympathogonioma with migratory cells and very malignant.
   b. Sympathoglioblastoma, more mature with true rosette formation.
   c. Sympathoblastoma. No such tumor was found in their series.
2. Incompletely differentiated tumors.
   a. Sympathetic neuroblastoma. These may have nerve fibers and are usually less malignant.
   b. Spongioblastoma.
   c. Chromaffinoblastoma. An early form of the chromaffin reaction cell of the sympathetic nervous system of the medulla.
3. Completely differentiated tumors.
   a. Ganglioneuroma. Mature ganglion cells and nerve fibers.
   b. Chromaffinoma similar to chromaffin cells of adrenal medulla.

By this classification 83 of the 162 cases were sympathoblastomas, or completely undifferentiated tumors; 15 were sympathetic neuroblastomas, or partially differentiated tumors; 8 were ganglioneuromas; and 56 could not be classified because of inadequate records.

The age incidence varied with the type of tumor found. The undifferentiated tumors occur chiefly in infancy and early childhood. The majority of the partially differentiated tumors occur late in childhood and a few during early adult life.

The degree of malignancy is inversely proportional to the degree of differentiation of the tumor cells. The undifferentiated type shows early widespread metastasis and is almost uniformly fatal. Lehman[3] reports a patient living fifteen years after removal of an adrenal tumor, which was proved to be neurocytoma by histologic examination. This is the exception since most of the patients present themselves to the physician after metastasis has occurred when surgical measures are hopeless.

The first case we are presenting would be classified as a Hutchinson's type of completely undifferentiated sympathicoblastoma of Bailey and Cushing,[12] or neuroblastoma of Robertson.[7] This case differs from any in the series of 162 reported in that it is a Hutchinson type of tumor, with primary bilateral adrenal tumor.

## CASE REPORT

CASE 1.—The patient, a five-year-old female, was admitted to Dr. Alton Goldbloom's service at Children's Memorial Hospital, Montreal. She had no illnesses with the exception of measles at the age of three.

In July, 1932, she developed high fever with vomiting, and severe pain in the left knee without redness or tenderness. The pain gradually decreased, to recur again in three weeks. In September, two months after the onset of symptoms, the parents noticed prominence of both eyes but especially the right. On Nov. 15, 1932, she was admitted to the Children's Memorial Hospital with complaints of an enlarged head, painful left leg, prominence of her eyes, and hemorrhage of the eyelids.

*Family History.*—Her father, mother, and three sisters are alive and well. There are no children dead. There was nothing of importance in the family history.

*Physical Examination.*—Examination of the child on admission showed an alert child, of normal mentality, with a large head, dilated scalp veins, bilateral proptosis, which was more marked on the right, hemorrhage into the right eyelid, all suture lines open and separated with soft tissue bulging through, and marked enlargement

Fig. 1.—Photograph of child at time of admission.

of the cervical and inguinal lymph glands. The chest was of the thin type. Breath sounds were normal. A soft systolic murmur was heard over the apex of the heart and over the aortic areas. The abdomen was protuberant and slightly tender in the upper half with no localization of the tenderness. The liver was palpable, three fingerbreadths below the costal margin in the midclavicular line.

In the midline of the abdomen was a hard, rounded, fixed mass which was only slightly tender. The mass was the size of a small orange and fixed to the deeper structures.

Neurologic examination was negative.

The eyes showed bilateral exophthalmos with limited occular movements, dilated veins of the eyelids and a distinct pallor of the optic disks.

The above symptoms and signs progressed until the right eye became almost enucleated before death. The abdominal tumor enlarged and a low grade fever persisted. Death occurred on Jan. 17, 1933, six months after the onset of her first symptoms.

*Laboratory Findings.*—Blood: red blood count, 1,310,000; white blood count, 6,200; hemoglobin, 45 per cent (Sahli); differential blood count showed polymorphonuclear leucocytes, 24 per cent neutrophiles, 3 per cent eosinophiles, 0 per cent basophiles, 1 per cent myelocytes, 1 per cent monocytes, and 71 per cent lymphocytes. The blood Wassermann test was negative.

The spinal fluid was clear and under increased pressure. The Pandy test was positive with no increase in cells. The total protein was 0.033 per cent and the sugar level, 0.09 per cent.

The urine was normal, and Bence Jones bodies were absent.

The roentgenologic report on November 15 was as follows: "There is evidence of widespread newgrowth involving the bones of the skull, humeri, right scapula, pelvis, and both femori. There is separation of the sutures of the skull."

*Summary of the Autopsy Report.*—The autopsy, performed sixteen hours after death, revealed a very poorly nourished white female child.

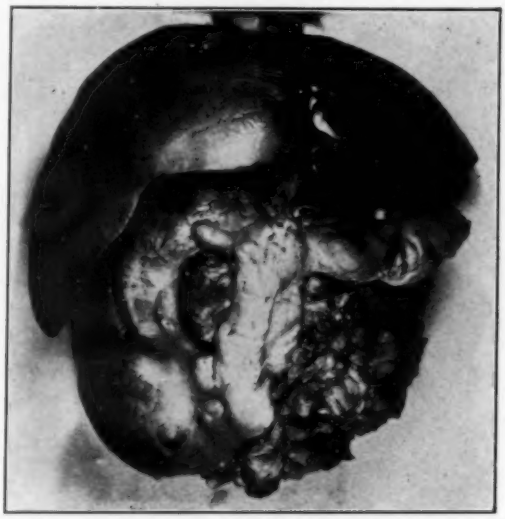

Fig. 2.—Photograph of liver, stomach, and first portion of small bowel with the large retroperitoneal tumor.

The peritoneal surface was smooth and glistening. A large tumor mass was present in the upper abdomen pushing the stomach and colon forward (Fig. 2). The mass was hard, nodular, purple in color, retroperitoneal, and filled a large portion of the abdomen measuring 13 by 13 by 15 cm. Two smaller tumors, each measuring 5 cm. in diameter, were attached to the iliac bones.

The liver was small, reaching just to the costal margin and showed no metastasis on its surface or on cut section. The cut section was brown with a fine yellow mottling.

The kidneys and adrenals were in relatively normal position. Both kidneys were normal in size. The right adrenal gland was replaced by tumor tissue which measures 2 by 3 cm. in diameter. On cut section the kidneys appeared normal. The tumor tissue of each adrenal was bluish purple in color, very soft, showing some necrosis near the center. The adrenal tumors were not part of the large retroperitoneal tumor mass (Fig. 3).

The lungs, heart, thyroid, thymus, spleen, stomach, pancreas, and intestines were normal with no sign of tumor metastasis.

The glands of the mesentery were large and hard, measuring from 1 to 2 cm. in diameter and were replaced by tumor tissue. All cervical, mediastinal, retroperitoneal, and inguinal lymph glands were enlarged, measuring from 1 to 4 cm. in length, were dark blue in color, very firm, and were replaced by tumor. Cut section of these appeared purple in color, the tissue very friable.

The periosteum over all the ribs was thickened. There were numerous purplish areas of discoloration beneath the periosteum which were found to be tumor tissue replacing bone. The anterior surface of the bodies of the vertebrae presented a picture similar to that described in the ribs.

The head was very large showing numerous large dilated scalp veins. The sutures were separated from 1 to 2 cm. with soft tissue bulging through the openings. When the scalp was reflected, the periosteum of the skull presented numer-

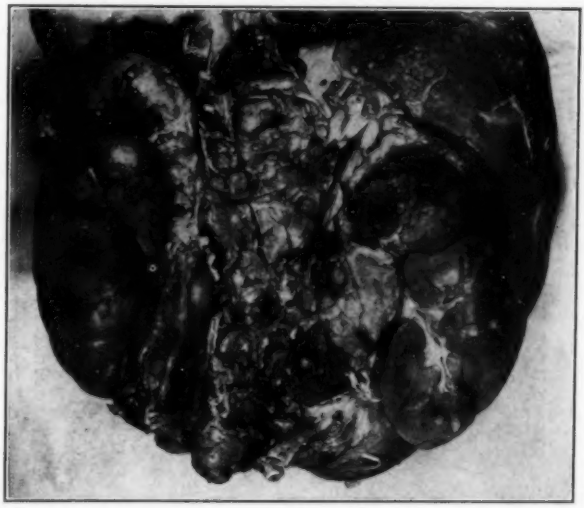

Fig. 3.—The section shows normal liver and kidneys with the large tumor replacing the right suprarenal gland and the multiple retroperitoneal metastasis.

ous bluish discolorations which were slightly raised and soft (Fig. 4). The skullcap was removed by cutting along the suture lines. The inner table of the skull was completely replaced by tumor tissue, which was soft, reddish in color, and very easily broken apart. In places the skull was of paper thinness. The tumor tissue surrounded the entire brain, being firmly adherent to the dura and making a pad from 1 to 2 cm. in thickness. Tumor tissue invaded the lateral, transverse, and longitudinal sinuses, almost completely occluding their lumina. A few of the large veins over the vertex of the brain were thrombosed by tumor tissue. The bone forming the wall of the orbit and the orbit itself were invaded by tumor tissue. The intraorbital pressure pushed the eye forward. There was no actual tumor involvement of the globe. There was marked conjunctivitis. A pad of tumor tissue covered the floor of the cranial cavity replacing part of the bony structure.

The lower half of the right femur was exposed, and a cylindrical soft tissue mass was found surrounding the lower 1½ inches of the femur, which had the appearance of the tumor tissue previously described.

The entire picture was that of a neoplasm arising as a bilateral adrenal tumor with metastasis in all of the bones and lymph glands, with the liver and lungs escaping.

The following microscopic description is based upon sections made from the primary tumors of the adrenals and their metastasis. Both the sections of the tumors and the metastasis are similar.

"Sections through the tumor of the adrenal show an encapsulated tumor with a small area of adrenal cortex. The cells here are normal. These are surrounded on all sides by tumor cells which infiltrate this area. The tumor consists of a rich cellular material irregularly distributed through which are areas of hemorrhage and necrosis. Irregularly distributed bands of connective tissue are present within the tumor substance. In these bands are numerous thin-walled blood vessels. By far the greatest amount of the newgrowth is made up of specific tumor cells. These cells vary in size, shape, staining reaction, and arrangement. The majority are small, round; they stain deeply and show either no demonstrable cytoplasm or only

Fig. 4.—Photograph of the skull after removal of the scalp showing the multiple metastasis of tumor.

a rim of such. There are a good many large cells several times the size of those described. Some of the large ones are multinucleated. As a rule, the tumor cells are irregularly distributed. In some places, however, they arrange themselves around a common lumen, resulting in a glandlike structure, the so-called rosette formation. In most instances the hemorrhage occurs in the region of the central area of irregularly outlined masses of tumor cells. The necrotic areas vary a good deal; some show necrosis of long standing with deposition of lime salts. There is no evidence of acute inflammation. In one area there is a blood vessel just below the surface with tumor cells in the lumen. These tumor cells are similar to those in the main tumor mass.

"The metastatic lesions are similar to the primary tumor described above. Besides the tumor cells within the blood vessels of the capsule of the adrenal tumor, cells are seen in the vessels elsewhere. Those around the aorta show a very marked change. Hemorrhage in some of the metastatic lesions is more marked than in the original tumor. No nerve fibers have been demonstrated."

*Microscopic Diagnosis:* Neuroblastoma.

CASE 2.—The patient was a three-year-old white female who was first seen on October 15. The parents said that the child had been complaining of abdominal pain for about two months. The pain had been intermittent, appearing for about one hour and then disappearing for a day or two. It was not associated with meals, and often it came on at night while she was in bed. The pain was never very severe, and it could not be well localized. About one week before admission to hospital the pain was a little worse, and with it there was some anorexia, constipation, and fever of one to two degrees Fahrenheit. Examination on admission revealed a fairly well-developed and well-nourished girl who at the time did not appear to be suffering pain. There was moderate resistance in the upper right quadrant of the abdomen, and a mass, which was considered to be kidney, could be palpated. The temperature was 99° F.; the leucocyte count was normal. During a week's observation in the hospital the child had no pain; her appetite was fair; and there was no abdominal tenderness. She was discharged to her home with instructions to return to hospital if the symptoms recurred.

About a week after discharge the child had a recurrence of her former symptoms. She was readmitted to hospital where a barium series was done and nothing abnormal was found. The child began having a low grade fever of 99 to 101° F.; the liver was slowly enlarging, and the child was becoming anemic. The blood examination showed 4,100,000 red blood cells, 66 per cent hemoglobin, 361,000 platelets, 0.5 per cent reticulocytes, coagulation time, 9 minutes (Lee and White); differential—69 per cent polymorphonuclears, 20 per cent lymphocytes, 7 per cent monocytes, and 4 per cent basket cells. The blood Wassermann test was negative. Cystoscopic examination revealed a normal bladder with normal urine coming from both ureters. Pyelograms showed the right kidney displaced downward and slightly outward but otherwise normal. This displacement was considered to be due to the enlargement of the liver. The urine cultures were negative, agglutinations of the blood for typhoid-paratyphoid group of organisms were negative, and examination of the stool for intestinal parasites was negative. Roentgenograms of the chest were negative.

The child continued to have slight fever, the liver enlarged, there was some slight resistance in the right upper abdomen with no tenderness, and no masses were felt at this time. The anemia became more marked, and the child became apathetic.

An exploratory laparotomy was performed by Dr. Dudley Ross, who reported: "A paramedian incision, extending from 1 inch below the xiphoid to slightly below the umbilicus on the right, exposed a large liver, which appeared to be pushed down and forward. There was no free fluid in the abdomen and no evidence of tumor in the liver. In the midline at the root of the mesentery of the small bowel could be felt a large mass of enlarged glands, rather firm and extending up into the upper right abdomen where they were connected to a large retroperitoneal mass located in the region of the adrenal gland. One of the lymph glands was removed for histologic examination. There were no further tumor masses felt in other parts of the abdomen."

The following microscopic description is made from a section prepared from a lymph node removed surgically from adjacent to the large tumor. The sections show a very hemorrhagic newgrowth. The cells of the newgrowth vary in size, shape, staining reaction, and arrangement. Most of them are very small and stain very deeply with hematoxylin and have little or no cytoplasm. This type makes up most of the tumor. There are some cells of the general type described, yet they are quite large. There is very little evidence of necrosis in the tumor. There are some quite well-defined rosette formations. No nerve fibers have been demonstrated.

*Histologic Diagnosis.*—Metastasis of neuroblastoma primary in the adrenal.

After the diagnosis had been made, the parents decided to remove the child to their own home. At the time of discharge, five months after the onset of first

symptoms, the child was very anemic; she had marked anorexia; and liver and abdomen were very large. Roentgenograms were taken of the chest, skull, and long bones just before discharge from the hospital, and there was no evidence of metastasis in any of the regions examined. She died at home April 8, 1934, eight months after the onset of her first symptoms. Postmortem examination was not made.

The diagnosis of neuroblastoma was made by biopsy. The findings of a right-sided tumor in the region of the adrenal gland and a large liver at operation and the lack of x-ray evidence of bony involvement would point toward a Pepper type of neuroblastoma.

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# ACUTE "PRIMARY" STREPTOCOCCUS PERITONITIS

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THE mortality in "primary" peritonitis is so exceedingly high that it is a disease which warrants serious consideration, even though the condition is rare. During a period of one month in the winter of 1935, there were admitted to the Abraham Jacobi Division for Children of the Lenox Hill Hospital four cases of peritonitis, which did not follow the perforation of an abdominal viscus. Such cases are usually classed as primary, although all followed a respiratory infection, and all had abnormal findings in the fauces or the lungs. It is difficult to give a satisfactory definition of primary peritonitis. The simplest is that of Duncan,[1] who says, "The term 'primary' is reserved for those cases which suddenly develop peritonitis unassociated with evidence of a pre-existing abdominal inflammation." Thus cases of peritonitis following appendicitis, suppuration of mesenteric or retroperitoneal lymph nodes, osteomyelitis of the hip with extension into the abdominal cavity, or peritoneal injections are excluded from this category. Limited by this concept, we are including summaries of nine cases of primary streptococcus peritonitis which have been admitted to the Willard Parker Hospital during the past ten years and which have not previously been reported.

*Etiology and Incidence.*—The bacteria causing primary peritonitis are usually streptococci or pneumococci, although occasional cases are due to staphylococci and even more rarely to other organisms. The incidence of primary peritonitis, as given by different authors, varies from 1 to 10 per cent of all abdominal surgical emergencies in children. The average incidence in large pediatric surgical services is about 3 to 5 per cent of acute abdominal conditions, although it must be realized that many cases do not come to the operating table. Including the twelve streptococcus cases reported in this paper, we have collected records of 308 proved cases of primary streptococcus peritonitis. Cases due to the pneumococcus are somewhat more common, and those due to other bacteria are much more rare.

*Portal of Entry.*—The organisms enter the body through either the nasopharynx, the gastrointestinal tract, or the female genital tract. In many cases of pneumococcus peritonitis, the pneumococci undoubtedly enter by the last named route and reach the peritoneum through the fallopian tubes.[1] But there are many pneumococcal cases in which one

From the Abraham Jacobi Division for Children of the Lenox Hill Hospital, service of Dr. Jerome S. Leopold, and the Willard Parker Hospital, Department of Hospitals.

of the other routes is obviously alone implicated. In practically all instances of streptococcal peritonitis the streptococci first lodge in the nasopharynx.

*Preceding Infections.*—In all series of reports of streptococcus peritonitis, a large proportion of the cases had an upper respiratory infection or pneumonia immediately prior to the onset of the peritonitis. For example, Nordlund[2] noted preceding respiratory infections in 63 per cent of his patients; Schwartz,[3] in 70 per cent; de la Chapelle,[4] in 75 per cent; and Felson and Osofsky,[5] in 100 per cent. Scarlet fever was associated with a primary streptococcic peritonitis in 20 cases collected from the literature by Sabadini.[6] Bartone[7] added one, and we are adding three more, making a total of twenty-four cases of primary streptococcus peritonitis developing in the course of attacks of scarlet fever. A number of cases of streptococcus peritonitis have occurred during epidemics of septic sore throat,* such as the milk-borne epidemic in Baltimore in 1912.[9] Occasionally there is a preceding erysipelas,[10] cervical adenitis,[11] retropharyngeal abscess, measles (authors), or any other condition in which a streptococcemia is present.

*Season.*—Almost all streptococcus cases occur in the winter months, when other types of streptococcal infection are prevalent. Eighty per cent of Nordlund's 57 patients were admitted during the six-month period from December through May. Pneumococcal peritonitis, however, occurs approximately as often in summer as in winter.

*Migration to Peritoneum.*—Granted that the nasopharynx is the most common portal of entry, how do the bacteria reach the peritoneum? While a few authors[12, 13, 14] believe that the organisms are swallowed and then migrate through the wall of the intestine, especially in the ileocecal region, most authors[2, 3, 5, 15, 16, 17] believe that the bacteria reach the peritoneum from the nasopharynx through the blood stream. Duncan[1] feels that in his series of 67 cases, some must be classified under each of the above named routes. When one studies the clinical histories of most cases of streptococcus peritonitis occurring during scarlet fever, in which one first notes a tonsillitis followed many days later by a streptococcemia, and finally after many more days or even weeks by peritonitis, one is inclined to regard the hematogenous route as the most likely and frequent.

*Sex.*—Of all published cases of streptococcus peritonitis in which the sex is stated, 71 (33.8 per cent) were males and 139 (66.2 per cent) were females. In the pneumococcus cases there was an overwhelming preponderance (80 to 100 per cent) of females.[1, 17, 18, 19]

*Age.*—Nordlund tabulated 153 cases of streptococcus peritonitis according to age: 88 (57.5 per cent) were under ten years; 26 (17 per

*There have been five bacteriologically proved cases and one presumptive case at the Willard Parker Hospital (1927-1936) out of a total of 11,669 scarlet fever admissions. Three of these have previously been reported by Kojis and McCabe,[8] and the other three are included here.

cent), between ten and twenty; 22 (14.4 per cent), between twenty and thirty years; and 17 (11.1 per cent) over thirty years.

*Mortality.*—The mortality in streptococcus peritonitis is extremely high: 64 to 100 per cent in all the series reported.[1, 12, 13, 15, 17] This is even higher than in the pneumococcus variety, in which it is as low as 23 to 60 per cent in some series,[1, 12, 18] although some authors report a mortality of 100 per cent. The mortality is influenced considerably by age, as is well illustrated by Duncan, who had a mortality of 100 per cent in 11 children under three years of age, and of only 16 per cent in 6 children over eight years of age.

*Diagnosis.*—The diagnosis of peritonitis due to any of the pyogenic cocci depends on a careful consideration of the history, the physical examination, and the laboratory findings. There is almost always a history of sudden onset of severe, generalized abdominal pain and tenderness. Vomiting is an outstanding symptom, appearing early, frequently before the pain, persisting to the end, and uncontrollable. There may be hiccough. Abt[20] states that the cessation of the vomiting indicates walling off of the peritonitis. Diarrhea, often marked, is very common, although there is occasionally obstinate constipation. The most constant finding in the physical examination is generalized abdominal spasticity and tenderness. Occasionally these may be very slight and localized, or entirely absent.[1, 20, 21] There are consistently distention and tympany. In most streptococcus and staphylococcus cases and in occasional pneumococcus cases, there are symptoms and signs of an upper respiratory infection or of pneumonia preceding the onset of the abdominal complaints by several days or even by as long as two weeks. The temperature is between 103° and 105° F. in most instances. X-ray examination may show evidence of pneumonia and of intestinal dilatation. The white blood count is consistently high (usually over 20,000 cells); the polymorphonuclear leucocytes are likewise considerably increased (usually over 85 per cent); and most important in the blood count is the marked "shift to the left," which is always present, even early in the disease (frequently over 50 per cent). The sedimentation rate is normal in almost all cases of acute appendicitis without perforation and is abnormal in all types of acute peritonitis.[22]

A definite clinical diagnosis of peritonitis cannot be made without operation or abdominal tap. The latter is very simple, informative and safe, as was made clear a decade ago by Neuhof and Cohen.[23] This procedure should be carried out in every case in which acute peritonitis in a child is suspected. Operation ought not be decided on until some information has been obtained from abdominal tap, if possible. In cases of acute peritonitis, such an examination, which takes only a short time, will occasionally save an ill-advised operation by demonstrating the type of organism on a smear of the fluid. If no fluid is obtained, the diagnosis of peritonitis is by no means ruled out. If a careful ex-

amination of the smear shows the presence of only streptococci or pneumococci, the case may temporarily, while awaiting the result of the culture, be considered a primary peritonitis and treated accordingly. If *Bacillus coli* is present or if more than one type of organism is seen, then the case must be considered as a peritonitis due to a ruptured abdominal organ, most likely the appendix. Piercing the intestine with the exploratory needle is so extremely rare that the presence of the colon bacillus in the smear must be interpreted in the above manner. The character of the fluid, aside from the characteristic coli odor, is of no value, as it is most variable in its physical properties. In attempting to distinguish clinically between streptococcal and pneumococcal peritonitis, it should be remembered that signs and symptoms of an upper respiratory infection or pneumonia speak for the former; a vaginal discharge or inflammation, for the latter. If the case occurs in the winter, especially when there are many streptococcus infections, or during an attack of scarlet fever,[6] septic sore throat,[9] erysipelas,[10] cervical adenitis,[11] or measles, it is probably of the streptococcus variety. If the patient is male, the peritonitis is almost surely not due to the pneumococcus. If the case is seen in the summer, it is probably not due to the streptococcus. Final differentiation depends on the bacteriologic examination of the abdominal fluid.

*Treatment.*—Since the mortality in all types of acute primary peritonitis is so appallingly high, the most important consideration, after the diagnosis has been established, is to give the patient the treatment most likely to save his life. Decision must be made either to operate or to wait. If acute appendicitis is suspected even after abdominal tap, immediate operation is the only choice. However, if the diagnosis of streptococcus or pneumococcus peritonitis has been definitely made, the question of operation versus purposeful delay must be considered. Immediate operation, especially in the streptococcus cases, is recommended by many authors.[3, 6, 12, 13, 15, 18, 24, 28] Delay of one or several weeks is the method of choice, especially in the pneumococcus cases, according to many other writers.[1, 16, 19, 29, 34] Budde[34] recorded a mortality of 90 per cent in his cases of pneumococcus peritonitis operated upon during the first few days of the illness, of 33 per cent if there was a delay of over a week, and of 7 per cent if the delay was even longer. Lazarus[35] stresses the point that operation should be performed either immediately or after several weeks, but not a few days after the onset of the illness, when the infection is spreading rapidly. Since streptococcus peritonitis has little tendency to localize,[36] most patients with this disease are doomed no matter what is done surgically. Pneumococcus peritonitis has more tendency to localize, a fact that must be taken into account in deciding when to operate. Obadalek,[12] whose mortality is the lowest of any large series in the literature, states that operation should be performed early in all cases, whether streptococcic or pneumococcic;

that drains should be used; that irrigation of the abdominal cavity should be done with large quantities of saline solution at operation, and sometimes later through the drainage tubes; and that the drains should be left undisturbed for ten days. Nordlund,[2] whose series of fifty-seven streptococcus cases is the largest reported, says that in fulminating cases with a likelihood of sepsis, when the diagnosis of streptococcus peritonitis is certain, operation should be deferred; but that in milder cases, if early in the disease, and in cases in which the diagnosis is in doubt, operation should be performed immediately. Of 308 cases of primary streptococcus peritonitis reported in the literature (including the present series), there are records* in 278 of whether or not operation was performed. Of the 278 cases, there were 44 recoveries, a mortality of 84.2 per cent. If one compares the result in the cases in which operation was performed with that in the cases in which operation was not performed, one sees a striking difference. Of 212 patients operated upon, there were 41 recoveries, a mortality of 80.7 per cent; and of 66 patients not operated upon, there were but three recoveries, a mortality of 95.5 per cent. The two groups are not entirely comparable, and as Duncan said, "It is not fair to draw conclusions as to the value of the nonoperative treatment . . . for many of them were so ill on admission that there did not appear to be any hope of saving them." Nevertheless, we feel that the difference in the mortality is great enough to make it clear that the treatment of choice, with Nordlund's reservations, is immediate laparotomy with drainage. The appearance of the peritoneal cavity at operation varies considerably, depending on how long the peritonitis has been present. Early in the disease, during the first twenty-four hours, the peritoneum and the serosal surface of the intestine, including the appendix, are congested and slightly edematous. There is usually a small amount of thin, turbid, yellow, serous fluid present. Later in the course of the infection, from the second to the fourth day, the serosal coat is covered with a fibrinous exudate; the congestion and edema are more marked; and the fluid is increased in quantity and is more purulent. After the peritonitis has been present even longer, there is a thick, plastic, fibrinous exudate covering the intestines; adhesions are usually present; and there is a larger amount of cloudy, yellow green, purulent fluid. At all stages the mesenteric and the retroperitoneal lymph nodes may be enlarged, firm and occasionally suppurating. If pus has escaped from one of these glands into the peritoneal cavity, the case is not considered a primary peritonitis.

In addition to laparotomy there are other therapeutic measures which must be considered. Transfusions have been of little avail, but it is possible that in selected cases numerous small transfusions might be of benefit. Paralytic ileus should be strenuously combated, as in other

*References 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 15, 17, 19, 24, 25, 26, 28, 33, 37, 38, 39, 40 authors.

types of acute peritonitis, with continuous gastric suction, a rectal tube, turpentine stupes, colonic irrigation, pitressin, and prostigmin. We recommend the trial of large doses of antipneumococcus or antistreptococcus serum or convalescent scarlet fever serum,[41, 42] beginning as soon as the diagnosis has been made, although there has been no series of cases reported in which these biologic agents have been employed. As a result of animal experimentation, Smith[43] believes that "the early therapeutic administration of (streptococcus) antitoxin should restrict tissue invasion." Rappaport and Brescia[44] recently reported the cure of one case of pneumococcus peritonitis, which result they attribute to the use of large amounts of homologous antipneumococcus serum intravenously plus frequent transfusions. They recommend this procedure in addition to surgical intervention, and they give a review of the literature concerning the treatment of pneumococcus peritonitis. With the advances which are gradually being made in biologic therapy, this form of treatment, in combination with appropriate surgery, would seem to offer the greatest hope for the future.

## SUMMARY

1. Twelve cases of streptococcus and one case of staphylococcus primary peritonitis, occurring, with one exception, in children between the ages of two months and twelve years, are reported.

2. There was one recovery, and autopsy records of the other twelve cases are presented.

3. The close relationship between streptococcus infections of the throat and streptococcus peritonitis is pointed out.

4. The portal of entry in almost all cases of streptococcus peritonitis is the nasopharynx, and the bacteria reach the peritoneum through either the blood stream or the intestinal tract.

5. The diagnosis of peritonitis due to the pyogenic cocci is discussed, with especial emphasis on the importance of performing an abdominal paracentesis before considering operation.

6. The mortality in streptococcus peritonitis is approximately 85 per cent. With operation it is about 80 per cent and without operation over 95 per cent.

7. Energetic specific serotherapy, in addition to transfusions and infusions, with immediate operation in most streptococcus cases and delayed operation in most pneumococcus cases seems to offer the greatest hope in the treatment of primary peritonitis.

## CASE REPORTS

### *Following Scarlet Fever*

CASE 1.—S. B., a twelve-year-old female, was admitted to the Willard Parker Hospital on April 15, 1933, with a history of seven days' illness, starting with a sore throat, cough, fever, and a rash. The day before admission the patient com-

plained of generalized abdominal pain, nausea, and vomiting, and had fever. Physical examination revealed an acutely ill girl, with a fading scarlatiniform rash and some desquamation. The pharynx was acutely inflamed. *Abdominal examination* showed marked tenderness throughout, especially in the left lower quadrant; generalized rigidity; rebound tenderness; normal peristaltic sounds. Rectal examination was negative. The temperature was 102.8° F.; the pulse, 126; and the respirations, 24. The white blood count was 24,000; the polymorphonuclear leucocytes, 94 per cent. The urine was normal.

The admission diagnosis was scarlet fever with acute mesenteric lymphadenitis or generalized streptococcus peritonitis. The patient was carefully observed for the next thirty hours, during which time she seemed to get progressively worse. She vomited green fluid several times. Severe abdominal pain persisted but was intermittent; and marked tenderness of the entire abdomen was consistently noted. The temperature varied between 102° and 104° F.; the pulse, between 130 and 140; and the respirations remained at about 30 per minute. Blood culture was negative at the end of twenty-four hours. Operation was performed thirty hours after admission under ether anesthesia. The preoperative diagnosis was generalized primary streptococcus peritonitis. On opening the peritoneal cavity, a large amount of yellow, seropurulent fluid was seen. The intestines were markedly injected and covered with a fibrinous exudate, and there was no perforation. A retrocecal appendix was found to be in the same condition as the intestines and was not gangrenous. It was removed and drains were inserted to the pelvis, upper abdomen, and appendix stump. The mesenteric lymph nodes were enlarged, but not suppurated. The other abdominal organs were normal.

Culture of the peritoneal fluid yielded the hemolytic streptococcus. The pathologist reported the appendix to be "inflamed secondarily to a general peritonitis."

*Postoperative Course.*—The temperature varied from 100° to 103° F., for three weeks; then from 99° to 101° F., for another two weeks; after which it remained normal until her discharge on the fifty-second day of her illness. The drains were removed on the fifth day postoperatively, and there was a moderate purulent discharge from the wound for five weeks. On the twenty-first postoperative day there was a sudden discharge of about 150 c.c. of pus, apparently coming from a deep abscess which drained through the abdominal wound. During the first ten days the child vomited occasionally, but after that she was symptomless. On the twenty-third day of the scarlet fever she developed an acute hemorrhagic nephritis. This gradually improved and by the time she was discharged, it was much less marked. This case is presented in considerable detail because of the rarity of recoveries in primary streptococcus peritonitis. The case is of especial interest because the surgeon, Dr. Edward McCabe,[8] has reported another recovery in which he employed exactly the same procedure: removal of the appendix, drainage, removal of the drains on the fifth day.

CASE 2.—L. C., a thirty-year-old colored female, was admitted to the Willard Parker Hospital on Feb. 14, 1933, with a history of seven days' illness, starting with a sore throat, hoarseness, and swollen glands of the neck. On the fourth day a punctate erythematous rash developed, and she had a temperature of 101.6° F.

Physical examination revealed a moderately ill, colored adult, with a punctate, erythematous eruption on the trunk, flushed skin, and desquamation of neck and chest. The pharynx and the tonsils were markedly congested; a mucopurulent exudate was present; there was an ulcer on the right posterior pillar. A mucopurulent nasal discharge was present. The abdomen was negative.

The admission diagnosis was scarlet fever. During the first eight days in the hospital the temperature ranged from 101° to 103° F., but no definite cause was

found for the fever. On the ninth day the patient became delirious. The lungs and abdomen were negative. The temperature rose to 104° to 105° F., and the white blood count was 36,200 cells, with 87 per cent polymorphonuclear leucocytes. The urine and the Wassermann test were negative. On the tenth day, an examination shortly before death revealed a "distended abdomen, apparently quite tender in the lower quadrants, especially the right." There were râles at both bases. There was no diarrhea. A blood culture taken the day before death was later reported positive for hemolytic streptococci.

The final clinical diagnosis was toxic scarlet fever; streptococcemia.

*Autopsy Report.*—The peritoneal cavity contained a large amount of thick, cloudy, brown fluid, in which some thick, white plaques of fibrin were found. The appendix, tubes, and ovaries had been removed (ten years previously). The mesenteric lymph nodes were moderately enlarged, but there was no suppuration. The gastrointestinal tract was intact. The pleural cavities each contained about 100 c.c. of thick, brown fluid with fibrinous plaques. The lungs showed marked confluent bronchopneumonia.

Cultures of the peritoneal fluid and of the blood yielded hemolytic streptococci.

The anatomic diagnosis was scarlet fever; streptococcemia; bilateral bronchopneumonia; bilateral empyema; acute generalized fibrinopurulent peritonitis.

CASE 3.—E. M., a two-year-old boy, was admitted to the Willard Parker Hospital on March 31, 1936, with a history of five days' illness, starting with vomiting and general malaise. The following day a rash and fever were noted; the next day sore throat and nasal discharge were present. The day prior to admission the neck glands became swollen, and the temperature rose to 105° F.

Physical examination revealed a well-developed, very ill boy. There was a moderately intense, punctate, erythematous rash on the trunk and extremities. The anterior cervical glands were the size of pigeons' eggs bilaterally. A profuse, seropurulent nasal discharge was present. The tongue was "strawberry" in appearance. There was marked congestion of the pharynx and tonsils, which were enlarged and covered with an exudate. The liver and the spleen were both 2 fingerbreadths below the costal margin. The heart and the lungs were normal. The temperature was 102° F.; the pulse, 120; and the respirations, 24. The white blood count was 22,250; the polymorphonuclear leucocytes, 74 per cent, of which 27 were immature. The red blood count was 3,710,000, and the hemoglobin, 55 per cent. The admission diagnosis was scarlet fever; bilateral cervical adenitis; hepatosplenomegaly.

*Course in the Hospital.*—On the fifth day the left eardrum ruptured spontaneously. A marked swelling and redness of the left thigh (at the site of a previous clysis) was first noted. Six days later a bilateral myringotomy was performed, and pus obtained from both ears. The culture of this pus yielded hemolytic streptococci. The abdomen was noted to be distended. Two days after this, there was severe abdominal distention. The left ear was still draining pus, and there was now mastoid tenderness on this side. The swelling of the left thigh was diffuse and very tender. Although the child's general condition was very poor, an operation for a deep abscess of the thigh was decided upon. Under ethylene anesthesia, an incision into the thigh was made, and a large amount of thin, flaky pus was obtained after going through the fascia lata. More pus was obtained by making an incision into the soft tissues over the lower end of the femur. At this point, the child ceased breathing and could not be resuscitated. During the thirteen days in the hospital the temperature ranged from 103° to 105° F., and two blood cultures were negative. On the fourth day the white blood count was 25,000; the polymorphonuclear leucocytes 95 per cent, of which 46 were immature.

The final clinical diagnosis was scarlet fever; bilateral cervical adenitis; sepsis; abscess of the left thigh; bilateral purulent otitis media; left mastoiditis.

*Autopsy Report.*—The peritoneal cavity contained about 300 c.c. of clear yellow fluid. The appendix was normal. The stomach and the intestines were markedly distended but not perforated. The mesenteric lymph nodes were prominent, pale, and not suppurating. In the lungs there were scattered areas of atelectasis. *Cardiac Findings:* The left ventricle contained a small amount of liquid blood and a clot, which extended into the orifice of the right coronary artery and for a short distance into the artery itself. The clot was not adherent to the ventricle wall or to the coronary artery. The spleen showed changes typical of an acute infection, as well as several recent infarcts.

Cultures of the peritoneal fluid, blood, mastoids, thigh, and larynx all yielded the hemolytic streptococcus.

The anatomic diagnosis was scarlet fever; dilatation of the heart; occlusion of the right coronary ostium by extension of ventricular clot; atelectasis of lungs; sepsis; bilateral mastoiditis; abscess of left thigh; generalized peritonitis.

*Following Measles*

CASE 4.—D. F., a female, aged one and one-half years, was admitted to the Willard Parker Hospital on Feb. 6, 1933, with a history of coryza, discharging ears, a maculopapular rash, and a temperature of 105° F., since the day previous.

Physical examination revealed a small child, who was apparently moribund. The temperature was 104.4° F.; the pulse, 170; and the respirations, 40. There was a maculopapular, erythematous eruption over the entire body. The conjunctivae were congested, and photophobia was noted. A mucopurulent nasal discharge was present. Koplik spots were seen, and the tongue papillae were hypertrophied. The pharynx was inflamed and edematous; the tonsils were hypertrophied, congested, and covered with mucopurulent exudate. There was marked cervical adenitis. Both ears were draining pus. There were a few râles at the bases of the lungs. The heart sounds were of poor quality. The abdomen was markedly distended and tympanitic, but no tenderness, rigidity, or masses were noted. Ten thousand units of scarlet fever antitoxin were given, although scarlet fever was not suspected. A clysis and a transfusion were also given. The white blood count was 18,850; the polymorphonuclear leucocytes were 86 per cent. A blood culture was positive for the hemolytic streptococcus. The child had several watery, green stools; the temperature fluctuated from 103° to 107° F., and the child died about thirty hours after admission or within three days of the onset of the illness. The clinical diagnosis was measles; bilateral acute purulent otitis media; bilateral acute cervical adenitis; bronchopneumonia; streptococcus tonsillitis.

*Autopsy Report.*—The peritoneal cavity contained a large amount of clear yellow fluid. The visceral peritoneum was inflamed, and there was a fibrinopurulent exudate present over the small intestine. The appendix was normal. The mesenteric lymph nodes were very large and inflamed, but there was no suppuration. The gastrointestinal tract showed no perforation. In the gastric mucosa there were numerous shallow ulcers with a hemorrhagic base, which appeared embolic in origin. The mucosa of the descending colon was acutely inflamed and studded with pinpoint ulcers. The anterior cervical and the mediastinal lymph nodes were enlarged and inflamed. The tonsils, larynx, vocal cords, trachea, and bronchi were congested and edematous.

Culture of the peritoneal fluid yielded a pure growth of the hemolytic streptococcus. The anatomic diagnosis was measles; streptococcemia; acute generalized peritonitis; acute tonsillitis, laryngitis, tracheitis, bronchitis; cellulitis of the neck; acute cervical, mediastinal, mesenteric lymphadenitis; acute ulcerative gastritis and colitis.

CASE 5.—V. M., a two-year-old female, was admitted to the Willard Parker Hospital on May 5, 1935, with a history of two weeks' illness. This started with an earache, which continued up to admission. Three days before coming to the hospital she had fever; the next day a rash on the face and a cough were first noted; on the following day the rash became generalized, there were lachrymation and a temperature of 102.4° F. Physical examination revealed a well-developed young girl with a generalized, maculopapular rash, conjunctivitis, Koplik spots, congested pharynx and tonsils, and normal heart, lungs, and abdomen. The diagnosis was measles.

The temperature on admission was 101.4° F., and rose three days later to 104° F., where it remained. Bilateral otitis media was diagnosed on the third day in the hospital, and the following day the child appeared very ill, with increased respiratory rate and bulging eardrums. The right eardrum was incised, and thick pus was obtained. The white blood count was 22,250, with 85 per cent polymorphonuclear leucocytes. An x-ray plate showed a pleural effusion on the right. The abdomen was distended. Two days later there were signs of a right upper lobe pneumonia; the right ear was still discharging; the left eardrum was subsiding; the abdomen was only slightly distended. On the next day there was marked abdominal distention; 150 c.c. of thin yellow pus was obtained from the right pleural cavity; the child died shortly after, on the thirteenth day of the measles. The final clinical diagnosis was measles; right acute purulent otitis media; lobar pneumonia; empyema, right.

*Autopsy Report.*—The peritoneal cavity contained about 100 c.c. of thin, muddy fluid. The intestines were greatly distended. The appendix was slightly injected. There was moderate enlargement of the mesenteric lymph nodes but no suppuration. The right pleural cavity was filled with green gray, thin, muddy fluid. The right lung was solid and pale. The left lung had small areas of consolidation in the lower lobe.

Cultures from the peritoneal fluid, blood, right pleural fluid, and right lung all yielded growths of *Streptococcus hemolyticus* and *Streptococcus viridans.*

The anatomic diagnosis was measles; bilateral bronchopneumonia; empyema, right; sepsis; acute generalized peritonitis.

CASE 6.—R. R., a three-year-old male, was admitted to the Willard Parker Hospital on March 10, 1936, after eight days of illness, starting with fever, cough, and vomiting. After two days the child was taken to a hospital, where physical examination and an x-ray picture demonstrated a lobar pneumonia on the left side. For three days the temperature remained at about 103° F., but the child did not seem very ill. The Mantoux test was positive. On the fourth day in the hospital, a morbilliform rash and Koplik spots were noted, and the child was transferred to the Willard Parker Hospital. Physical examination revealed a well-developed and nourished, moderately ill young boy, with an occasional cough. There were a few papular, erythematous lesions on the face. The conjunctivae were congested, and there was a crusted nasal discharge. Many Koplik spots were seen. The tonsils were enlarged and congested. The heart and lungs were normal. The abdomen was described as flatulent but otherwise negative. The temperature was 103.4° F.; the pulse, 140; and the respirations, 24. The admission diagnosis was measles.

Three days after admission both eardrums ruptured spontaneously, and culture of the pus yielded hemolytic streptococci. Five days after admission signs of consolidation of the entire left lung were present, and five days later empyema was diagnosed. Chest tap yielded 325 c.c. of green amber pus, which contained a pure growth of hemolytic streptococci. On the eleventh day in the hospital the right testicle became swollen, red and tender. This was thought to be due to orchitis. The abdomen was noted to be distended, and diffuse, marked tenderness was found.

There was frequent vomiting, which, with the physical findings, suggested the possibility of acute peritonitis. The next day frequent soft, light stools were passed. For the next ten days the abdomen continued to be markedly distended and tympanitic, but there was only slight tenderness and no rigidity. The testis remained red, swollen, and tender. Chest taps continued to yield large amounts of thick, yellow brown pus. The temperature varied between 99° and 106° F., usually 101° to 104° F. On the fifth day in the hospital the white blood count was 16,000, with 89 per cent polymorphonuclear leucocytes; on the tenth day, 25,600 and 83 per cent; on the seventeenth day, 13,600 and 78 per cent. The child gradually grew weaker and died on the twenty-seventh day of measles.

The final clinical diagnosis was measles; acute bilateral purulent otitis media; lobar pneumonia of entire left lung; empyema, left; right-sided orchitis; generalized peritonitis (?).

*Autopsy Report.*—The peritoneal cavity contained a very large amount of thick, brown, muddy fluid under pressure. There were a few small, localized pockets of pus. The appendix was normal. The intestines were moderately distended, but there was no obstruction or perforation. The mesenteric glands were moderately enlarged, but not suppurating. The left pleural cavity was half filled with fluid similar to that in the peritoneum. The left lower lobe was firm and brown. In the upper portion of a pneumonic process there was a small abscess filled with pus. Small abscesses, apparently of embolic origin, were identified on microscopic examination of both lungs. The tonsils were enlarged, inflamed, and contained several tiny pockets of pus. On microscopic section several necrotic areas with destroyed epithelium were found. In one necrotic area there was a blood vessel whose walls were necrotic and penetrated by bacteria. On opening the sac of the right testis, a considerable amount of pus escaped; this was in the tunica vaginalis; there was no apparent communication between it and the peritoneal cavity; the testis itself was not enlarged. The right mastoid contained a small amount of pus. The spleen showed the usual changes associated with a severe infection.

Cultures from the peritoneal cavity, blood, lungs, left pleural cavity, tonsils, larynx, right mastoid, and right tunica vaginalis all yielded pure growths of hemolytic streptococci.

The anatomic diagnosis was measles; acute purulent tonsillitis; streptococcemia; multiple embolic abscesses of both lungs; empyema, left; purulent periorchitis, right; right mastoiditis; generalized peritonitis.

### *Following Scarlet Fever and Measles*

CASE 7.—A.K., a female child, three and one-half years old, was admitted to the Willard Parker Hospital on May 30, 1931. She had had pneumonia at the age of one and one-half years. Four weeks before admission she had an illness which her physician diagnosed as measles, and one week before admission she again became ill, and her physician said that she had scarlet fever. Four days prior to coming to the hospital she vomited, had fever, pain in the chest, and was drowsy. There is in the history no mention of a rash.

Physical examination revealed a seriously ill young girl. She had a faint mottling (late measles?) over the entire body; desquamation in some areas (late scarlet fever?). The conjunctivae were injected and had a slight purulent discharge. There was some stomatitis; the tongue was coated and had enlarged papillae. The pharynx and the tonsils were moderately congested. In the *lungs* there were dullness, diminished bronchial breath sounds, and fine crackling râles over most of the left lung; slight dullness and bronchovesicular breath sounds were present in the right chest. The abdomen was negative. The temperature was 104.4° F.; the pulse, 150; and the respirations, 50. An x-ray plate confirmed the clinical

impression of a left pleural effusion. On the fourth day in the hospital a chest tap was done, and 570 c.c. of thick, creamy, green yellow pus was aspirated. The culture of this fluid yielded hemolytic streptococci. Three days later moderate distention and tenderness of the abdomen were first noted, and constipation was present. The next day the child vomited frequently; the vomitus was green yellow. The abdomen was markedly distended and typanitic but not markedly tender. The constipation persisted. Death occurred on that day.

The final clinical diagnosis was measles; scarlet fever; bronchopneumonia; and empyema, left.

*Autopsy Report.*—The peritoneal cavity contained about 150 c.c. of thick green pus with some fibrin. The mesenteric lymph nodes were markedly enlarged and congested, but not suppurated. The appendix was normal. The gastrointestinal tract was normal except for serosal injection. The pericardial cavity contained a small amount of sticky, fibrinopurulent exudate. The heart valves showed evidence of a healed endocarditis with small, pinhead-sized verrucae on the mitral cusps. In the left pleural cavity there was about 500 c.c. of thick, green pus. The left lung showed a pneumonic process scattered throughout; in the base there was a definite bronchiectasis of long standing.

Cultures from the peritoneum, pericardium, and blood all yielded hemolytic streptococci.

The anatomic diagnosis was scarlet fever(?); measles(?); bilateral bronchopneumonia; empyema, left; bronchiectasis in right lower lobe; acute generalized peritonitis; acute pericarditis; healed endocarditis.

*Following Scarlet Fever(?) and Varicella*

CASE 8.—M. B., a four-year-old colored female, was admitted to the Willard Parker Hospital on Feb. 17, 1934. Three weeks before, she began sneezing and coughing and seemed to have an ordinary cold. She did not complain of sore throat, and no rash was noted. From then until coming to the hospital she vomited occasionally, mostly during the first two weeks. One week before admission, a typical varicella eruption appeared. At this time she first began to complain of abdominal pain. She seemed to improve until four days before admission, when high fever was noted. She grew progressively worse, having fever, marked thirst, and restlessness.

On physical examination it was evident that the child was desperately ill. The respirations were rapid and labored. The temperature was 104.4° F.; the pulse, 140; and the respirations, 40. There was profuse desquamation of the skin, as well as numerous healed and healing varicella lesions. The tonsils were large and red, and the pharynx was very much congested. The cervical glands were moderately enlarged. At the left base there were marked dullness, bronchovesicular and diminished breath sounds, and a few râles. The abdomen was slightly distended, but otherwise negative. Neurologic examination was normal. A blood culture taken on admission was positive for the hemolytic streptococcus. The patient had several watery, foul-smelling stools, and vomited green, watery fluid several times. Death occurred twenty hours after admission.

The final clinical diagnosis was scarlet fever(?); varicella; pneumonia, left lower lobe; sepsis.

*Autopsy Report.*—The peritoneal cavity contained about 100 c.c. of orange yellow, turbid fluid. The appendix was normal. The mesenteric lymph nodes were slightly enlarged, and the retroperitoneal nodes were markedly enlarged, edematous, and slightly injected, but not suppurating. The gastrointestinal tract was intact. In the left lower lobe there were a few scattered areas of consolidation. The kidneys were soft and boggy, and the surface was congested, with purple and gray mottling; the cortex was swollen and the architecture distorted.

Blood culture yielded a pure growth of hemolytic streptococci, and a smear of the peritoneal fluid showed gram-positive cocci in short chains.

The anatomic diagnosis was scarlet fever(?); varicella; bronchopneumonia in the left lower lobe; acute interstitial nephritis; acute generalized peritonitis; streptococcemia.

*Following Respiratory Infections*

CASE 9.—M. K., a colored male, aged sixteen months, was admitted to the Willard Parker Hospital on March 29, 1931. Sixteen days previously he was found to have pneumonia, otitis media, and Klebs-Loeffler bacilli on throat culture. At Willard Parker Hospital these organisms were found to be avirulent. On March 29, he suddenly developed noisy and labored respirations with a brassy cough.

On physical examination snoring respirations were noted. The temperature was 100° F.; the pulse, 100; and the respirations, 30. The right eyelid was slightly swollen. A profuse seropurulent nasal discharge was present. The tonsils were large, and there was no membrane. There was a fluctuant mass the size of a walnut in the pharynx. Enlarged cervical nodes were felt. The lungs and the heart were normal. The abdomen was distended, but otherwise negative.

A diagnosis of retropharyngeal abscess was made, and the abscess was incised at once. About 1 or 2 ounces of green yellow pus was obtained, which on culture yielded the hemolytic streptococcus. On the fourth day in the hospital, bilateral otitis media was noted; both eardrums were incised, and pus was obtained. Three days later signs of pneumonia in the right upper lobe were found. During the next eleven days the pneumonic process was present, and then a diagnosis of empyema was made. Chest aspirations were performed on the following three days, and thin, green fluid was obtained on each occasion from the right pleural cavity. A blood culture taken on April 11 was negative. A transfusion was given on April 16. The first mention of abdominal signs was on April 17, when slight distention and constipation were noted. After an effectual enema the abdomen was said to be softer. There was no further mention of any abdominal signs or symptoms. The child died on April 19, after twenty-one days in the hospital, during which time the temperature fluctuated between 99° and 105° F.

The final clinical diagnosis was retropharyngeal abscess; acute bilateral purulent otitis media; pneumonia; empyema, right.

*Autopsy Report.*—In the peritoneal cavity there were about 100 c.c. of thin, green yellow pus. The appendix was normal. The intestines were distended. The mesenteric lymph nodes were moderately enlarged but not suppurating. The gastrointestinal tract was normal except for serosal congestion. The right pleural cavity was filled with purulent exudate similar to that in the peritoneal cavity. The right lung contained no air, and there were areas of consolidation throughout, especially in the upper lobe.

Cultures from the peritoneal fluid, pleural fluid, right lung, and blood were all positive for the hemolytic streptococcus. The anatomic diagnosis was bronchopneumonia in the right upper lobe; empyema, right; acute generalized peritonitis.

CASE 10.—C. B., a female child twenty-one months old, was admitted to the Lenox Hill Hospital on Feb. 23, 1935, with a history of ten days' illness, which started with vomiting, lasting two days. Five days before admission, the patient developed a throat infection with enlarged cervical glands and fever ranging from 100° to 101° F. During the three days preceding admission, there were present slight cough, a tender abdomen, constipation, and persistent vomiting. Physical examination revealed a fairly well-developed and nourished child, who was apparently moribund. The temperature was 103° F.; the pulse, 150; and the respirations, 56. The skin was dry and of poor turgor. The pharynx was moderately congested, and the tonsils were enlarged and inflamed. There were bronchial breath sounds and

râles extending from the angle of the left scapula to the base. The liver was palpable just below the costal margin, and the abdomen was tender and somewhat resistant throughout.

On the day after admission, the temperature rose to 105° F., where it remained until death. Diarrhea and persistent vomiting developed. The abdominal signs became more marked, as did the pulmonary findings. Bronchial breath sounds, dullness, and many crepitant râles were present at the left base, and there were numerous râles throughout the right lung. The child died forty-eight hours after admission. An abdominal tap done at the time of death yielded a thin, cloudy fluid, from which a pure culture of hemolytic streptococci was obtained.

The final clinical diagnosis was acute tonsillitis and pharyngitis; diffuse bronchopneumonia; acute generalized peritonitis.

*Autopsy Report.*—There was a diffuse fibrinopurulent peritonitis with considerable green yellow fluid. The entire small intestine was dilated. The ovaries were red and swollen. The uterus and the tubes were congested. Both lungs showed large, depressed, purple areas posteriorly. Microscopically there were congestion and considerable atelectasis and slight patchy bronchopneumonia. Microscopic sections of the kidneys and the adrenals showed congestion with many small hemorrhages throughout.

Cultures from the peritoneal cavity yielded a growth of hemolytic streptococci. There were no streptococci in the cultures of the lungs, pleurae, and vagina.

The anatomic diagnosis was diffuse fibrinopurulent peritonitis; pulmonary congestion and atelectasis.

CASE 11.—F. F., a male child fourteen months old, was admitted to the Lenox Hill Hospital on Jan. 28, 1935, with a history of having been ill for the past eighteen hours. He had appeared listless and feverish, and his respirations had been rapid and grunting. There had been three previous admissions to this hospital; twice for marasmus during the first two months of life, and once for bronchopneumonia at the age of four months.

Physical examination revealed a seriously ill child, who appeared well nourished and developed. The temperature was 105.2° F.; the pulse, 160; and the respirations, 44. The breathing was rapid and grunting, and there was dilatation of the alae nasi. The pharynx was slightly injected, and the tonsils were enlarged and slightly inflamed. There was dullness over the entire right chest posteriorly with many crepitant râles, especially at the base. The abdomen was tender and tense throughout. Rectal examination was negative. Roentgen ray examination of the lungs taken shortly after admission showed evidence of diffuse bilateral bronchopneumonia. There was marked distention of the stomach and the small intestines. The white blood count was 23,150; the polymorphonuclear leucocytes numbered 89 per cent, of which 50 were immature cells. The child vomited continually, the vomitus being brown but not fecal in character. The temperature rose to 108° F., and the child died twenty-nine hours after the onset of the symptoms.

The final clinical diagnosis was acute tonsillitis and pharyngitis; diffuse bilateral bronchopneumonia; and acute undetermined abdominal condition.

*Autopsy Report.*—In the peritoneal cavity there was some thick, yellow gray fluid, mostly in the upper portion with a small amount in the pelvis. The stomach and the first portion of the small intestine were dilated. The retroperitoneal lymph nodes were very prominent but not suppurating. Both lungs showed numerous depressed, purple, nonrepitant areas. Microscopically there were marked congestion and edema. Many alveoli were filled with an exudate containing red blood cells, polymorphonuclear leucocytes, and cellular detritus.

Culture of the peritoneal fluid yielded a pure growth of hemolytic streptococci.

The anatomic diagnosis was generalized purulent peritonitis; bilateral bronchopneumonia.

CASE 12.—F. L., a male six years of age, was admitted to the Lenox Hill Hospital on Feb. 20, 1935, with a history of sudden onset, thirty hours before admission, of nausea and vomiting—which became almost constant—frontal headache, drowsiness and delirium, stiffness of the neck, and high fever (104° F.). For eighteen hours before admission to the hospital, the child had had a sore throat, and his urine was said to be bloody. Five months previously he had suffered a depressed fracture of the skull, with complete recovery.

Physical examination revealed a well-developed and well-nourished boy, who was drowsy but mentally clear. The tonsils and the pharynx were markedly congested. There was slight rigidity of the neck; the Kernig sign was slightly positive bilaterally; the other reflexes were normal. The cervical glands were enlarged. The liver was 3 cm. below the costal margin, and the edge was tender.

A spinal tap was immediately done, and the fluid was found to be normal except for increased pressure. The white blood count was 25,150; the polymorphonuclear leucocytes 85 per cent, of which 31 cells were immature. The urine was smoky and showed microscopically many red and white blood cells and many granular casts; a large amount of albumin was also present. The blood urea nitrogen, 83 mg. per 100 c.c. at first, rose two days later to 100 and then fell to 61 in another two days. During the first four days the general condition improved and the temperature and pulse fell gradually to normal. On the fifth day in the hospital, the child complained of sudden, very severe, generalized abdominal pain, and the temperature rose rapidly to 106° F. Examination revealed a tense, tender and distended abdomen. The white blood count was 24,800; the polymorphonuclear leucocytes 95 per cent, of which 58 were immature cells. Abdominal tap yielded a thin, turbid, greenish fluid, which on culture showed a pure growth of hemolytic streptococci. During the next three days a stubborn paralytic ileus was combated and finally overcome, when signs of pneumonia and finally pulmonary edema developed. The boy died ten days after admission to the hospital or six days after the onset of the peritonitis.

The final clinical diagnosis was acute tonsillitis and pharyngitis; acute hemorrhagic nephritis; meningismus; acute generalized peritonitis; diffuse bronchopneumonia; pulmonary edema.

*Autopsy Report.*—In the abdominal cavity there was evidence of diffuse, marked, fibrinopurulent peritonitis. The mesenteric lymph nodes were congested but not suppurated. Microscopically they showed extreme, diffuse polymorphonuclear infiltration. The appendix and gastrointestinal tract showed no perforation. The kidneys showed congestion and numerous small hemorrhages. Microscopically there were minute hemorrhages, especially in the cortex, tubular degeneration, general congestion, and edema. Both lungs were markedly atelectatic and congested. Microscopically there were considerable atelectasis and edema. The left pleural cavity contained a moderate amount of green yellow pus. The brain was deeply congested and edematous.

Cultures from the peritoneal fluid, left pleural fluid, and blood all yielded pure growths of the *Streptococcus hemolyticus.*

The anatomic diagnosis was acute hemorrhagic nephritis; diffuse fibrinopurulent peritonitis; bilateral congestion and atelectasis of the lungs; empyema, left.

One case of primary staphylococcus peritonitis is added because of its rarity and because of its similarity to the above cases.

CASE 13.—P. G., a male infant two months old, was admitted to the Lenox Hill Hospital on Feb. 10, 1935, with a history of three days' illness. During this time he had numerous foul-smelling green stools, containing mucus. Fever and cough were also present. For twenty-four hours before admission he had rapid, grunting respirations. Physical examination revealed a well-developed and nourished

infant with rapid, grunting respirations and dilatation of the alae nasi. The temperature was 102.2° F.; the pulse, 156; the respirations, 56; and the weight, 12 pounds 7 ounces. The pharynx was slightly congested. The entire left chest was dull to flat posteriorly; the breath sounds were bronchial; there were no râles. The right lung was normal. The liver was felt several fingerbreadths below the costal margin. The following day the infant was moribund. The white blood cells numbered 35,300; the polymorphonuclear leucocytes, 79 per cent, of which 32 cells were immature. The red blood cells numbered 3,070,000; the hemoglobin content was 66 per cent. An x-ray examination revealed "evidence of pleural thickening in the outer zone of the left chest with some shaggy exudate and central consolidation in the region of the hilus and inner zone." There was no roentgenographic evidence of fluid in the pleural cavity. Nevertheless, the clinical signs of fluid were so clear that the chest was tapped in three places at the left base, but no fluid was obtained. The physical examination showed findings similar to those found on admission, except that the liver was farther below the costal margin. A transfusion of 120 c.c. of citrated blood was given. During the next two days the status was essentially unchanged, with the temperature 103° to 104° F. The abdomen was distended; gas was expelled through a rectal tube; the stools were loose but not frequent. The following day there were extreme dyspnea and cyanosis. Another chest tap was done, but again no fluid was obtained. The abdomen was noted to be soft. The temperature rose to 107° F., and the child expired on the fifth day in the hospital, or the eighth day of the illness.

The final clinical diagnosis was lobar pneumonia of the entire left lung; acute pharyngitis; acute enteritis.

*Autopsy Report.*—The peritoneal cavity contained some thin, watery, blood-tinged yellow fluid. The stomach and most of the small intestines were dilated. The mesenteric lymph nodes were not suppurating. Empyema which practically collapsed the lung was present on the left side. The posterior visceral pleura was almost fused to the parietal pleura by a tenacious, fibrinopurulent exudate. The left lung filled to about one-third its normal volume; it was consolidated and presented numerous small abscesses. The right lung had scattered patches of depressed, purple areas. Microscopically both lungs showed confluent bronchopneumonia with many small abscesses.

Culture of the peritoneal and pleural fluids yielded pure growths of *Staphylococcus aureus.*

The anatomic diagnosis was consolidation of both lungs with multiple abscesses; empyema, left; acute generalized peritonitis.

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26 EAST SIXTY-THIRD STREET
50 EAST SEVENTY-EIGHTH STREET

# LAURENCE-BIEDL SYNDROME

## Case Report

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THE most constant phenomena of this familial symptom complex are adiposogenital dystrophy, night blindness, retinitis pigmentosa, mental deficiency, and anomalies of development, e.g., polydactylism and syndactylism. The following is a typical case of this syndrome:

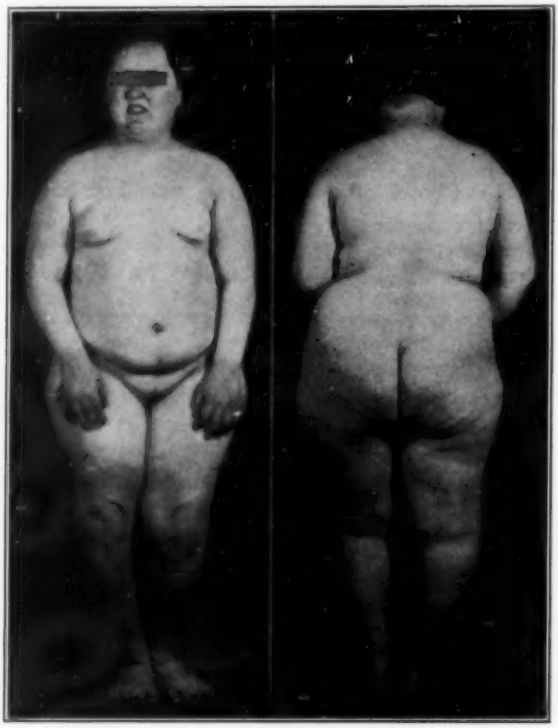

Fig. 1. Fig. 2.

N. A., a white girl, aged twelve years, was referred to the pediatric dispensary because of obesity and poor vision. The mother had had three miscarriages. Both parents were well, and three older brothers were in good health. One brother died at the age of eighteen years with congenital heart disease. The patient's birth was normal and at full term. Nothing unusual was noted except polydactylism

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and syndactylism. She was breast fed for the first eighteen months of life. Dentition, so far as could be determined, was normal. She walked at the age of one year and talked at two years, but after this she progressed slowly. She became abnormally obese and had no desire to play with other children, although there was no gross disturbance of behavior. At six years she was started to school but had progressed no further than the third grade when seen in the dispensary at the age of twelve years. The parents attributed this to failing vision which they had first noticed six years previously. She could not distinguish articles held before her and ran into objects at night unless she was led. Physical examination revealed an obese girl of about normal height (137.5 cm., 55 inches) for her age

Fig. 3.

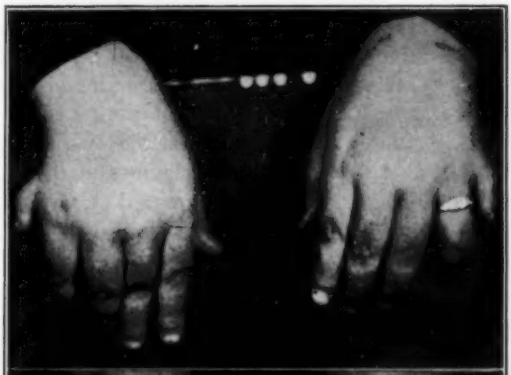

Fig. 4.

(Fig. 1). The weight was 61.4 kg. (135 pounds). The temperature and respiratory rate were normal. The pulse rate was 120 per minute. The blood pressure was 170 systolic and 80 diastolic. She was dull and obviously mentally retarded (estimated mental age of six years). The obesity was of the Fröhlich type (Figs. 1 and 2). The abdomen was protuberant with increase of girdle and suprapubic fat. The breasts were prominent; the proximal portions of the extremities were well rounded; and there was a marked degree of genu valgum and pes planus. Secondary sexual characteristics were absent. There was an extra digit on each hand (Fig. 3) and syndactylism and polydactylism of both feet (Fig. 4). Examination of the eyes showed no gross external defects but her vision could not be tested accurately because of poor cooperation. The peripheral fundi, however, showed discrete scattered splotches of pigment, dendritic in shape. There was beginning optic atrophy,

hyperphoria and considerable astigmatism. The retinal vessels were normal. The other findings were unessential. X-ray films of the skull and centers of ossification revealed normal conditions. The Wassermann and Kahn tests were negative.

## COMMENT

Almost a hundred cases have been reported in the literature, and numerous hypotheses have been advanced concerning its pathogenesis since it was first described by Laurence and Moon in 1866.[1] Biedl[2] felt that, since the roentgenograms of the sella turcica were normal, the syndrome was a familial form of adiposogenital dystrophy of cerebral rather than hypophysial origin. Raab's[3] explanation of a dysfunction of the centers of the hypothalamus by an obstruction of secretion from the pars intermedia by a high or massive sella turcica is not logical since an abnormal sella is not present in the majority of cases reported. A more recent and plausible theory has been suggested on the basis of a hereditary developmental defect, involving two or more genes, bearing unit characters, that may carry simple recessives but not simple dominants.[4, 5, 6]

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# ACUTE NICOTINE POISONING

## Report of a Case in a Child

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ACUTE nicotine poisoning has been recognized for many years and has been reported in the literature at infrequent intervals. Its occurrence in children has been referred to only in an occasional report, and an intensive review of all the pediatric periodicals fails to show a single reference to this clinical entity. The records of a large pediatric service for the past several years also fail to reveal a single previous diagnosis of nicotine poisoning.

The classical features of this condition have been described as sweating, nausea, vomiting, dyspnea, coma, convulsive seizures, pupillary changes, pulse rate first slowed and later accelerated, subnormal temperature and absence of tendon reflexes. These symptoms rapidly become more severe, and death follows in the majority of cases; or, in a few, the symptoms subside and the patient recovers completely in a few hours.

*History.*—S. H., a male white child, aged five years, was admitted to the ward on June 16, 1935, at 9:40 A.M., with a diagnosis of acute nicotine poisoning. A history obtained was that one hour previous to admission the child was given an enema consisting of 60 c.c. of strong tobacco juice in 1,000 c.c. of water. Almost immediately after the injection the child became unconscious and vomited almost continuously. On admission the child was comatose and continued to vomit. The vomiting was nonprojectile in type and consisted of mucus. The family and personal history was irrelevant other than that the mother had noticed pinworms and the tobacco juice enema was a misdirected effort at medication.

*Physical Examination.*—On admission the pulse was 120, temperature 96° F. and respirations 45. The blood pressure was 90 systolic and 68 diastolic. Examination revealed an acutely ill child who was comatose and continuously moaning. The skin over the entire body was moist and cold. The pupils reacted sluggishly to light and were unequal, the left being slightly dilated. Respirations were shallow and rapid. Heart rate was 120 per minute, of regular rhythm, and the sounds were of fair quality. Neurologic examination revealed sluggish reflexes throughout.

*Laboratory Data.*—The blood count showed white cells 10,300, red cells 5,120,000, and hemoglobin 90 per cent. The differential count was 88 per cent neutrophiles and 12 per cent lymphocytes. The blood Kahn reaction was negative. The Mantoux test was negative. The urine showed a trace of albumin, which was absent on subsequent examinations.

*Course.*—On admission caffeine sodium benzoate was given and repeated every thirty minutes for three times. External heat was applied, and copious enemas were given in an effort to eliminate the nicotine. The child regained consciousness in about one hour and appeared almost well in two hours with a normal temperature, pulse, and respiration. The child was dismissed on the third hospital day as completely recovered.

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## REVIEW OF LITERATURE

A review of the literature reveals the majority of the cases of nicotine poisoning to be in adults. Franke and Thomas,[1] in a recent report, were able to find seventy-four fatal cases of nicotine poisoning. The large majority of these cases were reported in the foreign literature and covered a period from the middle of the seventeenth century to the present time. Of these cases twenty-eight were from concentrated solutions of nicotine and forty-six from tobacco poisoning.

McNally[2] reported several fatal cases the result of mistaking insecticides for whiskey. Lockhart[3] reports severe poisoning in a girl employed in the manufacture of a nicotine insecticide. Two drams of a 95 per cent solution of nicotine was spilled on the sleeve of her overalls. She immediately removed the overalls, washed her arm, wiped off the sleeve and returned to work. Twenty minutes later she collapsed, was cold, pallid, and speechless. She appeared for thirty minutes to be on the verge of death but finally recovered.

Faulkner[4] reports the case of a florist who sat down in a chair on which had been spilled "Nico-Fume Liquid." Fifteen minutes later the patient presented the usual symptoms of nicotine poisoning and remained unconscious for three hours. The patient was given the same clothes on leaving the hospital four days later and was again seized with symptoms of nicotine poisoning in a few hours, but not nearly so severe. Besides the usual classic finding, Faulkner describes electrocardiographic changes suggesting myocardial damage in his case. Fretwurst and Hertz[5] demonstrated an increase in blood sugar and a leucocytosis in cases reported by them.

In reviewing the literature more thoroughly for the occurrence of nicotine poisoning in children, we find only a few cases reported. McNally[6] refers to the three cases reported by Weidanz with death in one and serious illness in two others, the result of tobacco's being sprinkled on the skin for treatment of favus. He makes reference to another case by Merrian resulting from application of a decoction of tobacco used in the treatment of ringworm of the scalp. McNally also mentions a case reported by an undesignated author in which an infant aged three years blew soap bubbles for one hour with a pipe and died on the third day. All the above cases in children were reported in the eighteenth century.

Bleasdale[7] reports a case similar to our own, in a child two years old who had been given a tobacco decoction rectally for the cure of intestinal parasites. This child presented the usual symptoms of a very serious character but recovered after artificial respiration had been administered for one hour.

The most recent reference to this condition in children is by Reynolds[8] in 1914. He reported the case of a five-month-old infant who was fed from a bottle into which tobacco had been accidentally dropped while

preparing the formula. The child was kept alive for some time by alternating periods of artificial respiration but died in one of the periods when his condition seemed favorable. As far as we can ascertain, only eight cases of nicotine poisoning have been reported in children, including the case in this paper.

## DISCUSSION

The infrequency of acute nicotine poisoning as a diagnosis is remarkable since tobacco is so commonly used. Nicotine, a liquid alkaloid, is the chief poisonous principle of tobacco. It has been estimated that one cigar contains enough nicotine to kill two persons if injected into the circulation. Tobacco contains from 2 to 7 per cent nicotine.

Acute nicotine poisoning, until the investigative work which has been published by Franke and Thomas,[9] was considered an almost hopeless condition. The belief has heretofore been prevalent that death was due to a generalized paralysis of the central nervous system. It has been definitely shown by the above investigators that death from acute nicotine poisoning is due to peripheral paralysis of the respiratory muscles when convulsions are prevented, and if these occur, to fixation of the respiratory muscles. Gold and Brown[10] also have recently published evidence that shows a peripheral rather than central paralysis.

Langley and Dickinson[11] showed many years ago that animals could be kept alive by artificial respiration after administration of what would otherwise be a fatal dose of nicotine. However, this work was not sufficiently publicized to cause adoption of this simple procedure as a definite therapeutic measure in acute nicotine poisoning of the human being.

Franke and Thomas[1] in a recent publication emphasize very strongly that artificial respiration started before the circulation has failed and continued until the muscular paralysis passes off should prove uniformly successful. They also have done experimental work showing a good possibility of restoring the circulation soon after it has failed, by injection of epinephrine into the left ventricle.

## SUMMARY

Although acute nicotine poisoning appears to be a relatively rare disease, the frequent exposure of children to tobacco in the American home makes it a clinical entity with which every physician should be familiar.

The possibility of acute nicotine poisoning should be strongly considered in all cases of undiagnosed coma. An attempt to elicit a history of contact with nicotine should always be made in these cases, for there is a possibility that many of these cases have occurred with a failure of diagnosis.

The classical experiments mentioned have established the definite therapeutic value of artificial respiration and the injection of epinephrine in cases where the heart has stopped beating.

It might be suggested that the mechanical respirator would furnish the ideal method of carrying on respiration in these cases until the temporary paralysis of the involved respiratory muscles has subsided.

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# EXPERIMENTAL VACCINATION AGAINST COLDS IN AN INFANTS' HOME

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THE reduction of the incidence of catarrhal infections of the upper respiratory tract in institutions for the care of children resolves itself into three lines of action: first, prevention of entrance of infection; second, preventing its spread; and third, increasing the power of resistance of those exposed. The first two methods are somewhat difficult (in spite of isolation) in view of frequent admissions and contact with the outside world, whether in the play yard or with visitors. In view of the foregoing, the third step, that of increasing the resistance, becomes more important, and vaccine was turned to as the easiest method available.

Colds were formerly believed to be due to the pneumococci, streptococci, influenza bacilli, and other organisms commonly found in the upper air passages. The causative agent is now looked upon as a filtrable virus,[1-4] which very often may be accompanied by secondary invaders (pneumococci, streptococci, influenza bacilli). Kneeland[5] found, in children afflicted with colds, a rise in the carrier rate of pathogenic organisms corresponding to an increase in the severity of the infection.

Vaccination against colds has been used for many years, both in adults and children, in the belief that it was directed against the specific agents. The vaccine may operate in a specific way to immunize against these secondary invaders, and may, second, as a nonspecific foreign protein, increase the general resistance of the body against infection. Such vaccination against colds was carried out at the Infants' Home of Brooklyn with the hope of reducing the susceptibility to colds and possibly modifying the course of the attacks.

The results of such experiments as have been reported in the literature are by no means decisive. The statistics of some authors show no effect; others show a slight relief, and the rest are noncommittal. W. H. Park and von Sholly[6] immunized 1,536 persons during 1919-1920 and gave three injections at weekly intervals. The vaccine was reported as having little value in preventing colds but as having a slight effect on their severity. Jordan and Sharp[7] used the same vaccine and technic as Dr. Park on 6,066 people in Florida and found almost the same frequency of rhinitis and bronchitis in the vaccinated and nonvaccinated groups. They stated that the pneumonia and influenza rates were somewhat lower among those vaccinated, but the difference was not great.

From the Infants' Home of Brooklyn and the Department of Laboratories, Israel-Zion Hospital.

In 1927 Ferguson, Davey, and Topley,[8] of Manchester, England, injected a group of 138 persons with three doses of vaccine at weekly intervals, using a slightly different type of mixture than that of Dr. Park. The English vaccine contained: *M. Catarrhalis,* 200M; Friedländer's bacillus, 200M; *B. septus,* 200M; *B. hoffmannii,* 200M; mixed staphylococci, 200M; Pfeiffer's bacillus, 120M; pneumococci, 40M; streptococci, 40M. The American vaccine in 1920 contained Pfeiffer's bacillus, 500M; hemolytic streptococci, 500M; *Streptococcus viridans,* 500M; pneumococcus type 1, 1,000M; type 2, 1,000M; type 3, 500M. Their results show a very slight decrease in the severity of the infection as measured by duration, days in bed, and days away from work, but they found no justification for the use of stock vaccines, as were available, in the hope of lessening the frequency of the common cold.

During the winter of 1929-1930, Brown[9] gave twelve doses of a specially prepared vaccine to medical students at the University of Cincinnati. He worked out a most thorough plan of preparation, including age, height and weight tables, past history of upper respiratory infections, environment, clothing and diet. Skin tests were also done, using each component of the vaccine as a separate antigen. The conclusion was that the statistical results showed little, if any, improvement as regards common colds in the experimental group as a whole compared with the controls.

Similar work has been carried out in Europe in children's homes and hospitals, by Stoltenberg,[10] at Oslo, and Gyllenswärd,[11] at Copenhagen. Both gave three injections at five-day intervals, using a vaccine containing pneumococci, streptococci, *M. catarrhalis* and Pfeiffer's bacillus. Stoltenberg injected 487 children and had 496 controls. His results show a beneficial effect among the vaccinated as compared with the nonvaccinated: per cent attacked, 47.9 nonvaccinated, 20.12 vaccinated; number of infections, 438 nonvaccinated, 118 vaccinated; index infectiosus (number of infections per child per hundred days), 1.73 nonvaccinated, 0.73 vaccinated.

Gyllenswärd, on the other hand, reported on 122 injected children and 125 controls and concluded that there were no great differences in the number of children ill, the number of recurrences, duration of illness, or frequency of complications.

Kneeland[12] injected twenty-three children at a Home for Infants in New York, giving two courses, one in October and the second in February, nine and seven doses, respectively, at weekly intervals. The vaccine contained pneumococcus type 1, *H. influenzae* and hemolytic streptococci in the ratio of 5:3:3. The number of individual respiratory infections were 5.4 in the vaccinated group and 5.8 in the controls. There was an alteration in the severity, as measured by the number of days of fever that occurred, even though no difference in the number of infections was noted.

## SCOPE OF EXPERIMENT

The Infants' Home of Brooklyn is a permanent home for children from birth through six years of age. They are classified as infants up to one year, toddlers up to two and a half years, and older children up to six years.

All newly admitted children are quarantined for three weeks in glass-walled cubicles in the admitting ward, with individual nursing technic. Routine nose and throat cultures are taken, and vaginal smears are made. The rest of the children are housed in open dormitories, according to age groups, males and females being separated only in the older division. The total resident population during the two years covered by the experiment was 60 in 1933 and 80 in 1934.

The group chosen for injection was made up of those children with past histories of frequent colds and upper air passage involvement. Controls were chosen in each of three age periods. No change was made in the normal routine, the diet remained the same, cod liver oil was given to the infants, and the outdoor play period under the supervision of the kindergarten staff was continued.

The injections were begun in October of each year, one course of eight subcutaneous injections was given semiweekly. The initial dose was 0.1 c.c. and was increased gradually up to 1.0 c.c., a total of 4.6 c.c. per child. Parke, Davis and Company catarrhal vaccine, combined (called "vaccine B" in the paper), was used in 1933. This contains Friedländer's bacillus, 50M; pneumococci (4 types), 100M; *M. catarrhalis*, 50M; *Streptococcus hemolyticus* and *Streptococcus nonhemolyticus*, 100M; *Staphylococcus albus* and *Staphylococcus aureus*, 700M; pseudodiphtheria bacillus, 100M; *B. influenza* (Pfeiffer), 100M.

The following year a nonspecific vaccine (called "vaccine A") obtained from saprophytic air bacteria was used as well as the Parke, Davis vaccine. The vaccine A was furnished through the courtesy of Dr. L. Rosenthal, director of laboratories of the Israel-Zion Hospital.

The period of observation lasted for one year in each experiment: all temperatures over 100° F. were recorded, as well as type and number of upper respiratory infections. Several children were discharged from the institution during the year and were excluded from the tabulations—24 injected in 1933 with 5 exclusions and 40 injected in 1934 with 6 exclusions. Two adult staff members were injected but were not included.

Skin tests were done by giving the first dose intradermally. There were only a few positive reactors, but, as the vaccine is a combination of bacteria, individual type sensitivity could not be determined.

## RESULTS

Tables I and II show the number of days of temperature over 100° F. in each age group during the first year, 1933-1934, for nineteen vaccinated and control children, respectively. These are represented graph-

TABLE I

NUMBER OF DAYS OF TEMPERATURE OVER 100° F.—VACCINATED GROUP, 1933-1934

| AGE IN YEARS | NO. INJECTED | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. | ANNUAL TOTAL | MEAN AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-1 | 5 | 0 | 0 | 0 | 5 | 8 | 11 | 9 | 2 | 7 | 7 | 11 | 6 | 66 | 13.2 |
| 1-2½ | 7 | 0 | 0 | 0 | 11 | 15 | 0 | 5 | 0 | 0 | 1 | 7 | 0 | 39 | 5.57 |
| 2½-6 | 7 | 0 | 0 | 2 | 5 | 2 | 0 | 0 | 2 | 3 | 0 | 3 | 8 | 25 | 3.57 |
| Total | 19 | 0 | 0 | 2 | 21 | 25 | 11 | 14 | 4 | 10 | 8 | 21 | 14 | 130 | 6.84 |

TABLE II

NUMBER OF DAYS OF TEMPERATURE OVER 100° F.—CONTROL GROUP, 1933-1934

| AGE IN YEARS | NO. INJECTED | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. | ANNUAL TOTAL | MEAN AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-1 | 5 | 2 | 4 | 5 | 7 | 15 | 3 | 20 | 3 | 10 | 4 | 30 | 21 | 124 | 24.28 |
| 1-2½ | 7 | 10 | 7 | 14 | 15 | 7 | 9 | 4 | 3 | 0 | 0 | 21 | 6 | 106 | 15.1 |
| 2½-6 | 7 | 2 | 4 | 1 | 12 | 1 | 0 | 8 | 7 | 2 | 1 | 0 | 3 | 41 | 5.86 |
| Total | 19 | 14 | 15 | 20 | 34 | 23 | 12 | 32 | 13 | 12 | 5 | 51 | 30 | 271 | 14.26 |

TABLE III

NUMBER OF DAYS OF TEMPERATURE OVER 100° F.—NONSPECIFIC VACCINE A GROUP, 1934-1935

| AGE IN YEARS | NO. INJECTED | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. | ANNUAL TOTAL | MEAN AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-1 | 5 | 0 | 21 | 20 | 24 | 6 | 0 | 1 | 7 | 1 | 6 | 2 | 0 | 88 | 17.6 |
| 1-2½ | 6 | 0 | 3 | 24 | 29 | 1 | 6 | 0 | 1 | 0 | 8 | 0 | 5 | 77 | 12.8 |
| 2½-6 | 6 | 0 | 2 | 18 | 10 | 4 | 2 | 1 | 1 | 0 | 0 | 0 | 1 | 39 | 6.5 |
| Total | 17 | 0 | 26 | 62 | 63 | 11 | 8 | 2 | 9 | 1 | 14 | 2 | 6 | 204 | 12.0 |

TABLE IV

NUMBER OF DAYS OF TEMPERATURE OVER 100° F.—VACCINE B GROUP, 1934-1935

| AGE IN YEARS | NO. INJECTED | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. | ANNUAL TOTAL | MEAN AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-1 | 5 | 0 | 7 | 28 | 25 | 12 | 7 | 2 | 0 | 1 | 7 | 3 | 2 | 94 | 18.8 |
| 1-2½ | 6 | 0 | 5 | 18 | 28 | 0 | 3 | 9 | 1 | 0 | 12 | 5 | 0 | 81 | 13.5 |
| 2½-6 | 6 | 0 | 0 | 16 | 10 | 0 | 2 | 5 | 0 | 2 | 0 | 2 | 0 | 37 | 6.16 |
| Total | 17 | 0 | 12 | 62 | 63 | 12 | 12 | 16 | 1 | 3 | 19 | 10 | 2 | 212 | 12.53 |

TABLE V

NUMBER OF DAYS OF TEMPERATURE OVER 100° F.—CONTROL GROUP, 1934-1935

| AGE IN YEARS | NO. INJECTED | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. | ANNUAL TOTAL | MEAN AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-1 | 5 | 0 | 9 | 29 | 28 | 22 | 5 | 14 | 10 | 13 | 11 | 5 | 2 | 148 | 29.6 |
| 1-2½ | 6 | 0 | 1 | 18 | 29 | 7 | 3 | 7 | 1 | 0 | 27 | 4 | 1 | 98 | 16.3 |
| 2½-6 | 6 | 0 | 2 | 26 | 5 | 1 | 1 | 2 | 0 | 4 | 6 | 0 | 0 | 47 | 7.83 |
| Total | 17 | 0 | 12 | 73 | 62 | 30 | 9 | 23 | 11 | 17 | 44 | 9 | 3 | 293 | 17.23 |

ically as monthly totals for all ages in Fig. 1. The vaccinated group had 130 days of fever (temperature over 100° F.); the controls had 271 days. This difference is similarly reflected in the separate age groups: infants, 66 days; toddlers, 39 days; older, 25 days among the injected children, as compared with 124, 106, and 41 days among the respective

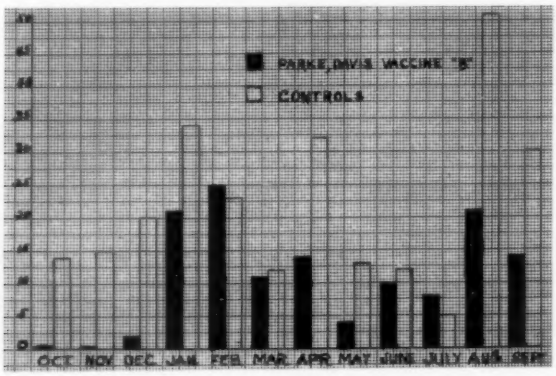


Chart 1.—Monthly total of days with temperature over 100° F. for all age groups, 1934-1935.

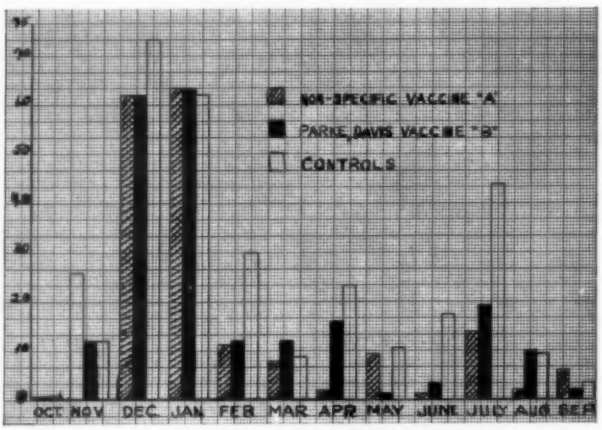


Chart 2.—Monthly total of days with temperature over 100° F. for all age groups, 1934-1935.

controls. The average number of days of fever per child was 6.84 for vaccinated groups and 14.26 for the control groups.

Tables III, IV, and V represent the results of the second year, 1934-1935, for vaccine A, vaccine B, and control groups, respectively. During the winter months of 1934-1935, there was a particularly severe epidemic of upper respiratory infections which raised the total days of

fever considerably over that of the preceding year. There was very little difference between the nonspecific vaccine A and vaccine B, 204 and 212 days, while the control group had 293 days of fever. The monthly totals are shown in Chart 2. The average number of days of fever per child for the year was 12 for vaccine A group, 12.52 for vaccine B group, and 17.23 for the untreated control group.

Tables VI and VII show the number of colds for each age group during the two years and the index infectiosus. This index was described by Stoltenberg[10] and is defined as the number of infections per child per hundred days. There was an appreciable, though slight, difference between vaccinated and unvaccinated control children during the first year, 1933-1934, with 37 colds as compared with 52 colds, respectively, and a rise in the combined index infectiosus for all age groups from 0.534 in the experimental to 0.75 in the control children.

TABLE VI

NUMBER OF COLDS AND INDEX INFECTIOSUS, 1933-1934

| 1933-1934 | | VACCINE B | | CONTROLS | |
|---|---|---|---|---|---|
| AGE IN YEARS | NO. INJECTED | NO. OF COLDS | INDEX INFECT. | NO. OF COLDS | INDEX INFECT. |
| 0-1 | 5 | 19 | 1.04 | 20 | 1.09 |
| 1-2½ | 7 | 10 | 0.39 | 24 | 0.939 |
| 2½-6 | 7 | 8 | 0.31 | 8 | 0.31 |
| Total | 19 | 37 | 0.534 | 52 | 0.75 |

TABLE VII

NUMBER OF COLDS AND INDEX INFECTIOSUS, 1934-1935

| 1934-1935 | | VACCINE A | | VACCINE B | | CONTROLS | |
|---|---|---|---|---|---|---|---|
| AGE IN YEARS | NO. INJECTED | NO. OF COLDS | INDEX INFECT. | NO. OF COLDS | INDEX INFECT. | NO. OF COLDS | INDEX INFECT. |
| 0-1 | 5 | 13 | 0.717 | 13 | 0.717 | 19 | 1.04 |
| 1-2½ | 6 | 14 | 0.685 | 14 | 0.685 | 14 | 0.685 |
| 2½-6 | 6 | 6 | 0.274 | 8 | 0.365 | 10 | 0.456 |
| Total | 17 | 33 | 0.531 | 35 | 0.564 | 43 | 0.693 |

The gap between the two groups was not so marked during the second year, however, the total number of colds being 33 for the vaccine A group, 35 for the vaccine B group, and 43 among the control group. The combined index infectiosus rose only slightly from 0.531 and 0.564 for vaccines A and B groups, respectively, to 0.693 in the control series.

## DISCUSSION

The results of the two-year study period show the variations obtainable in the use of vaccines for prophylaxis against colds. During 1933-1934, there was a reduction of 52 per cent in the number of days of fever in the vaccinated group and almost 29 per cent less colds. This coincides with the favorable results reported by Stoltenberg[10] from Oslo

and by Kneeland[12] in New York. Ernberg,[13] in discussing Gyllenswärd's work, stated that he had good results with Parke, Davis and Company vaccine used on 49 nurses, but gave no figures.

The results of the second year, 1934-1935, were not so favorable as those of the preceding period. There was almost no appreciable difference in the number of days of fever or the number of colds between the nonspecific vaccine A and the vaccine B. The noninjected controls showed an increase of 29 per cent in the days of fever and had almost 21 per cent more colds. This bears out the contention of several investigators that the number of days of fever was decreased, i.e., the severity was lessened, but the actual number of colds showed only a slightly appreciable change.

It is possible that better results may be obtained by increasing the dosage of the vaccine, but more improvement might result by using the particular antigen to which the children are sensitive.

## SUMMARY

Vaccination against upper respiratory infections (colds) was attempted at an infants' home over a two-year period, from 1933 to 1935, 19 children being injected the first year and 34 the second. There was a definite decrease in the severity of the infections, as measured by the number of days of temperature over 100° F., but only a slight reduction in the actual number of infections.

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# THE SIGNIFICANCE OF AND A DIFFERENTIAL DIAGNOSTIC TEST OF PRECORDIAL MURMURS IN CHILDREN

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SINCE the invention of the stethoscope by Laennec in 1819, the question of the importance of precordial murmurs has disturbed the mind of many a clinician. At first it was agreed upon that the murmur represented a serious pathologic cardiac condition and meant a lifelong period of invalidism. However, since it developed that many of these foredoomed individuals persisted in maintaining a rather protracted hold on life, and often indulging in a strenuous one, a need for reconsideration of murmurs was in order. As is usual when a new school of thought makes its début, extremes express the changing order; thus it has been declared that a cardiac murmur per se meant absolutely nothing. MacKenzie[1] often advised throwing the stethoscope away! Cabot stated that a systolic murmur without other signs of heart disease was of no importance as evidence of valvular lesions. The majority of present-day physicians have been following this trend of thought. The New York Heart Association in its "Criteria for the Diagnosis of Heart Disease"[2] specifically insists that a patient with a murmur and without other distinctive concomitant findings is to be grouped in Class E (functional heart disease).

More recently, however, a number of observers have become less adamant and are recognizing the probability that many so-called functional heart cases are truly organic. Smith[3] recommended that every heart with a murmur be examined at periodical intervals in order to detect other possible evidences of heart involvement as the years pass. Freeman and Levine[4] in a study of one thousand consecutive noncardiac cases concluded that a systolic murmur of greater intensity than grade 2 should be regarded with suspicion. Fineberg and Steuer,[5] in a follow-up study of one hundred children with an uncomplicated systolic apical murmur, discovered that 30 per cent developed serious valvular complications within a period of five years. Friedlander and Brown[6] in a very recent study felt that the louder murmurs are probably associated with organic cardiovascular disease. Levine[7] frankly states that all systolic murmurs need consideration and that the louder ones are always associated with some form of cardiovascular disease. White[8] also agrees that the louder the murmur, the more likely it is to be organic. As a result of all these studies, the murmur is beginning to receive greater

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consideration. We all concur with Simpson and Batten,[9] who say that murmurs are responsible for more troubles and difficulties than all the other cardiac signs put together.

If one were to acquiesce in the belief that the mere presence of a murmur is of no significance, then our procedure is simple, namely, to ignore it and the patient. But if we accept the plea of the authors that an early insidiously developing rheumatic infection of the heart may present no other evidence except a precordial murmur, the importance of recognizing the true nature of this murmur is not so much a matter of declaring the individual so afflicted a "cardiac," but rather, in acknowledging that a rheumatic heart means greater susceptibility to reinfection. Only with this understanding will a greater effort be expended in classifying properly the child with a murmur. This will result in the very early diagnosis of a treacherous condition and will be helpful in preventing subsequent morbidity and precocious mortality.

If a method or means were devised to differentiate the so-called functional murmur from the truly organic one, an important aid will be given both the physician and the patient. Many characteristics have been ascribed to distinguish one from the other, but we are in accord with Morse,[10] who says, "There is no certain distinction between organic and functional murmurs." Morison[11] described the use of amyl nitrite inhalation as a means of accentuating and so differentiating murmurs. However, Kahler's[12] results using similar methods were completely the reverse, and, as will be seen later, our own experience with amyl nitrite is more in accordance with that of Kahler. Bass, Mond, Messeloff and Oppenheimer[13] have made use of a phonocardiograph to differentiate the two types of murmurs, but this method appears somewhat complicated for general use.

Five years ago one of us[14] devised a means of accentuating and localizing cardiac murmurs by the use of a subcutaneous injection of epinephrine 1:1,000. At that time 62 children of the cardiac out-patient department were tested. Of this number, 32 were considered clinically as having functional or Class E murmurs. Following the epinephrine test, 23, or 71.2 per cent of the cases so tested, were considered as definitely presenting an underlying organic cardiac condition and not functional as was presupposed. The character of the murmur, rather than the accepted criteria was the basis for this conclusion. It was the opinion of the writer at that time, and it is now our belief, that there is a stage in organic valvular heart disease of children in which there is no visible hypertrophy of any of the heart chambers and in which there are none of the conditions usually associated with a well-established valvular lesion. This period may be of variable duration depending upon many factors: the virulence and progression of the infecting agent, the number of recurrences of the infection, the individual resistance, and the cardiac response of the child afflicted. In our estimation a fairly loud

precordial murmur with maximum intensity at or near the apex and transmitted over the precordium or toward the axilla is indicative of an underlying organic valvular condition.

Levine divides murmurs into six grades according to intensity. The first two groups, he claims, are almost always noncardiac, the remaining four grades being usually organic. We prefer, for the sake of simplicity, to arrange the murmurs into three groups according to intensity. Those that are either faint or very soft are most likely functional; the moderately loud and the very loud comprise the second and third grades, respectively. These latter two we consider always organic, even in the absence of other criteria. When the epinephrine caused a faint or very soft murmur to appear, the case was placed in group 1 and considered nonorganic; when placed in group 2 or 3, the case was considered organic. Frequently a fairly loud murmur appeared localized at the second left interspace; this was also considered as being functional.

TABLE I

PATIENTS TESTED FIVE YEARS AGO, WITH EPINEPHRINE DIAGNOSIS THEN, AND CLINICAL DIAGNOSIS NOW

| 1931 | | | 1936 | |
|---|---|---|---|---|
| NUMBER TESTED | MURMUR LOCALIZED TO BASE OR DIMINISHED | MURMUR INCREASED NEAR APEX | CLINICAL HEART DISEASE | PER CENT OF PREDICTED HEART DISEASE |
| 32 | 9 (28.2%) | 23 (71.8%) | 11 (34.3%) | 47.8% |
| *Cases Tested in New Group, 1936* | | | | |
| 37 | 14 (37.9%) | 23 (62.1%) | On above basis, number expected to develop definite organic heart disease within 5 years 11 (47.8%) | |

Five years have elapsed since the epinephrine test was performed on the original group of thirty-two children with a clinical diagnosis of functional cardiac disturbance. The purpose of this paper is, first, to follow up the clinical condition of this group of children and, second, to test a new group of similar cases. A percentage of the new group was given a preliminary test with amyl nitrite, as described by Morison, before proceeding with the epinephrine.

Of the original group of 32, the present diagnosis in accordance with accepted criteria shows that of the 9 patients in whom the diagnosis remained as functional or Class E after the epinephrine test, 5 are still clinically Class E; 3 have been discharged as noncardiac; and one child has been lost to the records. Of the 23 children in whom the epinephrine diagnosis was organic valvular heart disease, today 9 are still considered as being clinically in Class E and 11 have a definite valvular defect; the remaining 3 have been lost track of. This means that 47.8 per cent of an original group of 23 children with a so-called clinical functional precordial murmur have, within a period of five years, developed typical

organic valvular heart defects. According to Chart 1, in the children under ten years of age the clinical findings five years later do not completely bear out the epinephrine diagnosis, but, in the children over ten, the test appears to be 100 per cent correct. Up to and including ten years, 15 cases were called organic and 2 Class E after the test; five years later 5 are clinically organic while 14 are still being classified as functional. However, this does not necessarily mean that these children do not have an organic valvular defect. In the first place, it is rather difficult to concede that a precordial murmur present for five years is entirely accidental, and, second, it is a well-known fact that the rheumatic states may be dormant for many years only to appear at some indefinite time. Continued observation will offer the only certainty. There is one point we wish to mention: in our out-patient department

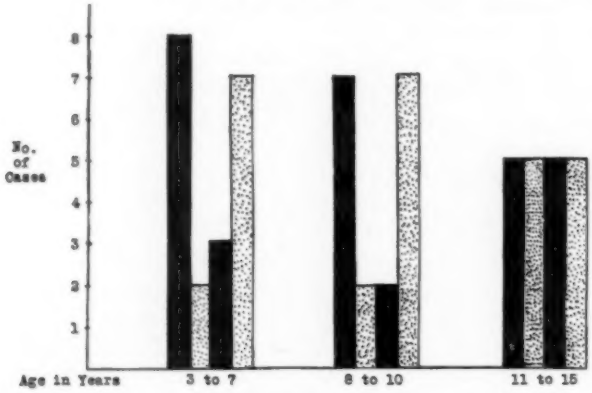


Chart 1.—Class E cardiac children tested with epinephrine, showing the diagnosis following the test and the clinical diagnosis five years later.

The solid columns represent the organic cases and the stippled columns, Class E cases. The first two columns show the diagnosis after epinephrine and the second two columns, the clinical diagnosis five years later.

the child is first examined in the general clinic, and, if a faint murmur is noted at the base, the child is not referred to the special clinic. This necessarily eliminates a very large group of functional murmurs.

## PROCEDURE

Thirty-seven children clinically in Class E, according to the criteria of the New York Heart Association, were selected for this study. Twelve of these were given the preliminary amyl nitrite test. The ages of the children varied from five to fifteen years; 22 were under ten years old, and 15 were ten years old or over. For comparative purposes, a group of 15 children with a clinical diagnosis of organic heart disease was also given the test. All were tested about two hours after breakfast. No child having a rectal temperature over 100° F. or who appeared to be

ill was included. The patient was placed in the recumbent position and the pulse and blood pressure taken. The precordium was then auscultated for heart sounds and murmurs. Epinephrine 1:1,000 was injected into either deltoid region, the patient remaining in the recumbent position throughout the test period. The child under eight years received 6 minims, the older child, 8. Immediately following the injection and every five minutes thereafter, the pulse, blood pressure readings, and auscultatory findings were recorded (Table II). Variations of the murmur in quality, intensity, duration, and location were noted. This examination was continued for a period of thirty minutes. The maximum effect of the drug occurred from ten to twenty minutes after the injection. At the conclusion of the period each child was able to go home feeling perfectly well. No deleterious effects were observed in any case. In the twelve children receiving the amyl nitrite, a 3 minim perle was crushed and held over the child's nostrils for a few seconds until physiologic changes, such as flushing and rapid pulse, occurred. Observations similar to those following the epinephrine were made, but these had to be done immediately because of the evanescent action of this drug. With the return of the pulse and blood pressure to normal, which usually occurred within a few minutes, the subcutaneous epinephrine test was given. This offered an excellent opportunity for comparison of both drugs.

## OBSERVATIONS

In 6 cases, following the amyl nitrite inhalation, the soft, grade 1 systolic murmur disappeared, and in four the murmur became louder. It was strange that 5 of the same 6 developed a grade 2 murmur after the epinephrine. Of the 4 in whom the murmur became intensified by the amyl nitrite, in 3 after the epinephrine the murmur completely disappeared, and in only one did the murmur remain loud. In the 2 organic cases the murmur of one became louder at the base after the amyl nitrite and softer after the epinephrine suggesting the likelihood of this case really being in the functional group (Table III).

Following the amyl nitrite, the pulses were accelerated up to 200 beats per minute and were rather thready. The systolic, as well as diastolic, blood pressures abruptly fell in all but one case to as much as 40 mm. of mercury (Chart 2 and Table III).

Following the epinephrine injections, in 14 patients the grade 1 murmurs either disappeared or retained their grade 1 quality. In 23 cases there was a distinct change in the intensity of the murmurs; 18 being placed in grade 2, and 5 in grade 3. In other words, by means of the epinephrine test we have decided that 62.1 per cent of a group of children with functional heart murmurs most likely have early cases of organic heart disease and should be observed accordingly. Of those in whom the murmur became intensified, 5 children presented a very loud grade 3 murmur along the left sternal border at the third and fourth

TABLE II

52 CASES WITH OBSERVATIONS BEFORE AND AFTER THE EPINEPHRINE TEST

| CASE NO. | NAME | AGE (YR.) | SEX | CLINICAL DIAG. | EPINEPHRINE 1:1000 MINIMS | PULSE | | BLOOD PRESSURE | | MURMUR | | DIAGNOSIS AFTER TEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | BEFORE EPIN. | 20 MIN. AFTER | BEFORE S. D. | AFTER S. D. | BEFORE | AFTER | |
| 1 | R. R. | 9 | M | Class E | 8 | 92 | 100 | 138/88 | 150/56 | + Ster. | + Base | Class E |
| 2 | J. R. | 15 | M | Class E | 8 | 68 | 80 | 130/70 | 138/60 | + Ster. | + Ster. | Class E |
| 3 | J. C. | 9 | F | Class E | 8 | 84 | 100 | 114/70 | 128/68 | + Apex | + + Apex | M. I. |
| 4 | I. S. | 14 | F | Class E | 8 | 80 | 88 | 110/74 | 148/70 | + Ster. | + Ster. | Class E |
| 5 | A. D. | 8 | M | Class E | 8 | 84 | 100 | 114/70 | 124/60 | + Ster. | + + Apex | M. I. |
| 6 | L. M. | 14 | M | Class E | 8 | 72 | 80 | 140/80 | 124/60 | + Base | + Base | Class E |
| 7 | D. A. | 5 | F | Class E | 6 | 88 | 160 | 114/60 | 120/60 | + Ster. | + + + Ster. | Cong. Pat. I. V. S. |
| 8 | S. P. | 6 | M | Class E | 6 | 80 | 120 | 90/64 | 132/38 | + Ster. | + + Apex | M. I. |
| 9 | E. S. | 5 | M | Class E | 6 | 108 | 100 | 90/46 | 96/48 | + Base | + + + Ster. | Cong. P. I. V. S. |
| 10 | M. W. | 6 | M | Class E | 6 | 96 | 112 | 88/68 | 98/50 | + Ster. | + + Apex | M. I. |
| 11 | J. H. | 7 | M | Class E | 6 | 64 | 72 | 102/60 | 104/44 | + Ster. | + Base | Class E |
| 12 | I. S. | 7 | F | Class E | 6 | 100 | 110 | 90/58 | 116/40 | + Ster. | + + Apex | M. I. |
| 13 | M. K. | 11 | F | Class E | 8 | 64 | 88 | 106/50 | 118/50 | + Ster. | + Base | Class E |

TABLE II—CONT'D

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | S. T. | 10 | M | Class E | 8 | 112 | 116 | 108/60 | 108/60 | + | — | Class E |
| 15 | W. N. | 11 | M | Class E | 8 | 86 | 76 | 112/60 | 110/40 | Ster.<br>+ | + + | M. I. |
| 16 | E. L. | 6 | F | Class E | 6 | 92 | 120 | 110/60 | 120/48 | Ster.<br>+ | Apex<br>+ + | M. I. |
| 17 | E. B. | 6 | M | Class E | 6 | 108 | 100 | 130/80 | 132/70 | Ster.<br>+ | Ster.<br>+ + + | Cong. |
| 18 | M. S. | 7 | F | Class E | 6 | 96 | 92 | 94/40 | 128/48 | Ster.<br>+ | Ster.<br>+ + | P. I. V. S.<br>M. I. |
| 19 | I. P. | 6 | F | Class E | 6 | 104 | 120 | 130/70 | 100/64 | Ster.<br>+ | Apex<br>+ | Class E |
| 20 | Z. B. | 9 | F | Class E | 8 | 80 | 92 | 98/50 | 110/50 | Base<br>+ | Base<br>+ + | M. I. |
| 21 | F. A. | 6 | F | Class E | 6 | 80 | 120 | 90/60 | 130/60 | Apex<br>+ | Apex<br>+ | Class E |
| 22 | R. G. | 5 | F | Class E | 6 | 110 | 100 | 96/60 | 102/66 | Ster.<br>+ | Base<br>+ + + | Cong. |
| 23 | P. S. | 7 | M | Class E | 6 | 100 | 88 | 92/60 | 100/64 | Ster.<br>+ | Ster.<br>+ + | P. I. V. S.<br>M. I. |
| 24 | H. S. | 9 | M | Class E | 8 | 88 | 80 | 110/70 | 112/72 | Ster.<br>+ | Apex<br>+ + | M. I. |
| 25 | S. B. | 14 | F | Class E | 8 | 80 | 84 | 120/80 | 128/88 | Ster.<br>+ | Apex<br>— | Class E |
| 26 | S. T. | 10 | M | Class E | 8 | 112 | 140 | 108/60 | 112/80 | Ster.<br>+ | + + | M. I. |
| 27 | F. S. | 11 | M | Class E | 8 | 88 | 90 | 120/80 | 130/84 | Apex<br>+<br>Ster. | Apex<br>+ +<br>Apex | M. I. |

TABLE II—CONT'D

| CASE NO. | NAME | AGE (YR.) | SEX | CLINICAL DIAG. | EPINEPHRINE 1:1000 MINIMS | PULSE | | BLOOD PRESSURE | | MURMUR | | DIAGNOSIS AFTER TEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | BEFORE EPIN. | 20 MIN. AFTER | BEFORE S. D. | AFTER S. D. | BEFORE | AFTER | |
| 28 | C. W. | 12 | F | Class E | 8 | 80 | 92 | 100/40 | 140/58 | + Ster. | + + Apex | M. I. |
| 29 | L. B. | 13 | M | Class E | 8 | 88 | 96 | 120/70 | 140/38 | + Apex | + + Diast. Ster. | A. I. |
| 30 | I. S. | 12 | F | Class E | 8 | 80 | 92 | 116/80 | 100/60 | + Ster. | — | Class E |
| 31 | E. H. | 9 | M | Class E | 8 | 80 | 80 | 80/84 | 86/50 | + Ster. | — | Class E |
| 32 | H. O. | 5 | M | Class E | 8 | 80 | 96 | 90/44 | 110/16 | + Ster. | + Ster. | Class E |
| 33 | E. C. | 8 | F | Class E | 8 | 104 | 98 | 102/48 | 108/52 | + Ster. | + + Apex | M. I. |
| 34 | F. B. | 12 | F | Class E | 8 | 102 | 120 | 120/80 | 150/70 | + Ster. | + + Apex | M. I. |
| 35 | T. C. | 9 | M | Class E | 8 | 80 | 88 | 104/60 | 120/80 | + Apex | + + Apex + Diast. | M. I.-M. S. |
| 36 | R. L. | 12 | M | Class E | 8 | 88 | 92 | 120/80 | 124/88 | + Ster. | — | Class E |
| 37 | M. G. | 10 | F | Class E | 8 | 120 | 100 | 112/60 | 120/80 | + Base | + + + Ster. | Cong. P. I. V. S. |
| 38 | T. V. | 12 | M | M. I. | 8 | 92 | 90 | 100/40 | 106/50 | + Ster. | + Base | E. F. |
| 39 | L. M. | 11 | F | M. I. or cong. | 8 | 110 | 98 | 110/80 | 140/60 | + + Ster. | + + + Ster. | Cong. P. I. V. S. |

TABLE II—CONT'D

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | A. P. | 8 | M | M. S. or A. I. | 8 | 96 | 110 | 112/72 | 118/80 | + Diast. Apex | + + Diast. Ster. | A. I. |
| 41 | V. B. | 10 | F | M. I. | 8 | 82 | 96 | 108/80 | 112/88 | + + Apex | + + Apex | M. I. |
| 42 | A. P. | 9 | F | M. I. | 8 | 88 | 100 | 102/60 | 112/66 | + Ster. | — | Class E |
| 43 | G. S. | 14 | F | M. I. | 8 | 88 | 100 | 110/66 | 114/58 | + Apex | + + Apex | M. I. |
| 44 | E. P. | 15 | M | M. I. | 8 | 80 | 88 | 120/60 | 130/68 | + Apex | + + Apex | M. I. |
| 45 | S. P. | 12 | M | M. I. | 8 | 100 | 120 | 110/40 | 110/60 | + Apex | + + Apex | M. I. |
| 46 | B. W. | 7 | F | M. I. | 8 | 132 | 120 | 110/40 | 100/38 | + Apex | + + + Apex | M. I. |
| 47 | S. K. | 10 | F | M. I. | 8 | 120 | 120 | 114/50 | 96/40 | + Apex | + + + Apex | M. I. |
| 48 | I. A. | 13 | F | M. I. | 8 | 84 | 80 | 108/70 | 120/70 | + Apex | + + Apex | M. I. |
| 49 | S. A. | 10 | M | M. I.-M. S. | 8 | 80 | 100 | 112/84 | 110/68 | + + Apex | + + Apex | M. I.<br>M. S. |
| 50 | L. D. | 12 | F | M. I. | 8 | 100 | 100 | 130/76 | 120/70 | + Diast. Apex | + + Apex | M. I. |
| 51 | B. I. | 5 | F | M. I. | 6 | 100 | 108 | 80/65 | 110/30 | + Apex | + + Apex | M. I. |
| 52 | R. L. | 8 | M | M. I. | 8 | 88 | 90 | 110/82 | 120/86 | + Apex | + + Apex | M. I. |

TABLE II—CONT'D

| CASE NO. | NAME | AGE (YR.) | SEX | CLINICAL DIAG. | EPINEPHRINE 1:1000 MINIMS | PULSE | | BLOOD PRESSURE | | MURMUR | | DIAGNOSIS AFTER TEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | BEFORE EPIN. | 20 MIN. AFTER | BEFORE S. D. | AFTER S. D. | BEFORE | AFTER | |
| 28 | C. W. | 12 | F | Class E | 8 | 80 | 92 | 100/40 | 140/58 | + Ster. | + + Apex | M. I. |
| 29 | L. B. | 13 | M | Class E | 8 | 88 | 96 | 120/70 | 140/38 | + Apex | + + Diast. Ster. | A. I. |
| 30 | I. S. | 12 | F | Class E | 8 | 80 | 92 | 116/80 | 100/60 | + Ster. | — | Class E |
| 31 | E. H. | 9 | M | Class E | 8 | 80 | 80 | 80/84 | 86/50 | + Ster. | — | Class E |
| 32 | H. O. | 5 | M | Class E | 8 | 80 | 96 | 90/44 | 110/16 | + Ster. | + Ster. | Class E |
| 33 | E. C. | 8 | F | Class E | 8 | 104 | 98 | 102/48 | 108/52 | + Ster. | + + Apex | M. I. |
| 34 | F. B. | 12 | F | Class E | 8 | 102 | 120 | 120/80 | 150/70 | + Ster. | + + Apex | M. I. |
| 35 | T. C. | 9 | M | Class E | 8 | 80 | 88 | 104/60 | 120/80 | + Apex | + + Apex + Diast. | M. I.-M. S. |
| 36 | R. L. | 12 | M | Class E | 8 | 88 | 92 | 120/80 | 124/88 | + Ster. | — | Class E |
| 37 | M. G. | 10 | F | Class E | 8 | 120 | 100 | 112/60 | 120/80 | + Base | + + + Ster. | Cong. P. I. V. S. |
| 38 | T. V. | 12 | M | M. I. | 8 | 92 | 90 | 100/40 | 106/50 | + Ster. | + Base | E. F. |
| 39 | L. M. | 11 | F | M. I. or cong. | 8 | 110 | 98 | 110/80 | 140/60 | + + Ster. | + + + Ster. | Cong. P. I. V. S. |

TABLE II—CONT'D

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | A. P. | 8 | M | M. S. or A. I. | 8 | 96 | 110 | 112/72 | 118/80 | + Diast. Apex | + + Diast. Ster. | A. I. |
| 41 | V. B. | 10 | F | M. I. | 8 | 82 | 96 | 108/80 | 112/88 | + + Apex | + + Apex | M. I. |
| 42 | A. P. | 9 | F | M. I. | 8 | 88 | 100 | 102/60 | 112/66 | + Ster. | — | Class E |
| 43 | G. S. | 14 | F | M. I. | 8 | 88 | 100 | 110/66 | 114/58 | + Apex | + + Apex | M. I. |
| 44 | E. P. | 15 | M | M. I. | 8 | 80 | 88 | 120/60 | 130/68 | + Apex | + + Apex | M. I. |
| 45 | S. P. | 12 | M | M. I. | 8 | 100 | 120 | 110/40 | 110/60 | + Apex | + + Apex | M. I. |
| 46 | B. W. | 7 | F | M. I. | 8 | 132 | 120 | 110/40 | 100/38 | + Apex | + + + Apex | M. I. |
| 47 | S. K. | 10 | F | M. I. | 8 | 120 | 120 | 114/50 | 96/40 | + Apex | + + + Apex | M. I. |
| 48 | I. A. | 13 | F | M. I. | 8 | 84 | 80 | 108/70 | 120/70 | + Apex | + + Apex | M. I. |
| 49 | S. A. | 10 | M | M. I.-M. S. | 8 | 80 | 100 | 112/84 | 110/68 | + + Apex | + + Apex | M. I. M. S. |
| 50 | L. D. | 12 | F | M. I. | 8 | 100 | 100 | 130/76 | 120/70 | + Diast. Apex | + + Apex | M. I. |
| 51 | B. I. | 5 | F | M. I. | 6 | 100 | 108 | 80/65 | 110/30 | + Apex | + + Apex | M. I. |
| 52 | R. L. | 8 | M | M. I. | 8 | 88 | 90 | 110/82 | 120/86 | + Apex | + + Apex | M. I. |

TABLE III

EFFECT OF AMYL NITRITE AND EPINEPHRINE ON THE MURMUR, PULSE, AND BLOOD PRESSURE OF A GROUP OF TWELVE CHILDREN

| CASE NO. | MURMUR | | | PULSE | | | BLOOD PRESSURE | | |
|---|---|---|---|---|---|---|---|---|---|
| | BEFORE TESTS | AFTER AMYL NITRITE | AFTER EPI-NEPH. | BEFORE TESTS | AFTER AMYL NITRITE | AFTER EPI-NEPH. | BEFORE TESTS S. D. | AFTER AMYL NITRITE S. D. | AFTER EPI-NEPH. S. D. |
| 1 | + | – | ++ | 80 | 160 | 92 | 112/50 | 100/40 | 140/58 |
| 2 | + | – | ++ | 88 | 164 | 96 | 120/70 | 104/58 | 140/38 |
| 3 | + | +++ | – | 80 | 160 | 92 | 116/80 | 100/60 | 124/80 |
| 4 | + | ++ | – | 76 | 140 | 80 | 100/80 | 90/60 | 86/50 |
| 5 | + | ++ | – | 84 | 100 | 78 | 90/44 | 70/30 | 110/60 |
| 6 | + | – | ++ | 104 | 144 | 98 | 102/84 | 76/44 | 108/52 |
| 7 | + | – | ++ | 96 | 180 | 120 | 120/80 | 112/30 | 150/70 |
| 8 | + | – | ++ | 80 | 200 | 88 | 104/76 | 94/70 | 120/80 |
| 9 | + | – | + | 88 | 160 | 92 | 120/76 | 90/62 | 124/84 |
| 10 | + | +++ | ++ | 120 | 160 | 110 | 112/60 | 100/50 | 120/80 |
| 11 | + | ++ | + | 92 | 140 | 96 | 100/40 | 86/40 | 112/50 |
| 12 | ++ | + | ++ | 96 | 160 | 108 | 112/44 | 82/38 | 120/60 |

Key: +, grade 1 murmur, Class E, faint or soft.
++, grade 2 murmur, moderately loud,
+++, grade 3 murmur, very loud.
–, no murmur.

interspaces. In our opinion the location and intensity of these murmurs justified a probable diagnosis of congenital heart defect, most likely due to a small septal lesion. In 16 cases a fairly loud systolic murmur appeared, with maximum intensity at the apex, transmitted to the axilla. These were considered cases of organic mitral insufficiency. Another child developed a very definite systolic and diastolic murmur near the apex, suggesting the probability of concomitant mitral stenosis. In one child with a history unknown, after the epinephrine, a loud diastolic murmur appeared at both the second right and third left interspaces. In this case a pistol-shot murmur was present in the groin, and the blood pressure changed from a normal of 120 systolic and 70 dias-

TABLE IV

GROUPS OF CHILDREN RECEIVING THE EPINEPHRINE TEST, WITH DIAGNOSIS BEFORE AND AFTER THE TEST

| | AFTER EPINEPHRINE |
|---|---|
| Before epinephrine, 37 cases Class E, functional murmurs | 14 cases: same diagnosis, Class E<br>16 cases: organic mitral insufficiency<br>5 cases: congenital heart defect<br>1 case: mitral insufficiency and stenosis<br>1 case: aortic insufficiency |
| Before epinephrine, 15 cases organic mitral insufficiency | 11 cases: same diagnosis, mitral insufficiency<br>1 case: congenital defect<br>1 case: aortic insufficiency<br>1 case: Class E<br>1 case: Class E and F |

tolic to a systolic of 140 and diastolic of 38. All these findings left no doubt in our mind that the child under consideration suffered from an organically incompetent aorta.

Of the 22 under ten years of age, there were 6 in whom the epinephrine diagnosis remained the same, while in 16 the diagnosis was changed to organic heart disease. Of the 15 children ten years old and over, 9 remained the same, and in 6 the diagnosis was changed. So evidently there appears to be a greater discrepancy in the cardiac diagnosis of younger children (Table IV).

The pulse rates before the epinephrine averaged 90.4 beats per minute; the slowest being 64 and the fastest being 120 beats per minute.

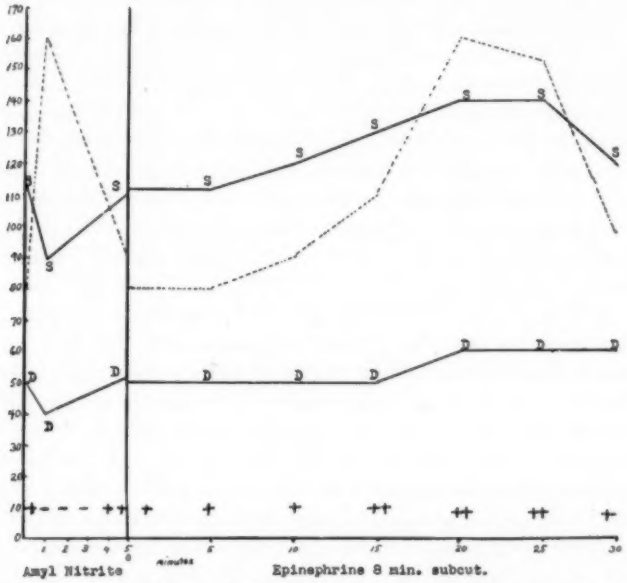


Chart 2.—C. W., female, aged twelve years, negative history. At rest a soft systolic murmur is heard along the sternum. After amyl nitrite no murmur is heard. After epinephrine a loud systolic murmur is heard at the apex and is transmitted to the axilla. Impression: Mitral insufficiency.

Pulse is indicated by the broken line; *S*, systolic blood pressure; *D*, diastolic blood pressure. Murmurs, –, none; +, grade 1; ++, grade 2; +++, grade 3.

Following the epinephrine the maximum rise was up to 160, while the lowest rate was 72 beats per minute. The average rate twenty minutes after the epinephrine was 95.3 beats per minute.

## DISCUSSION AND CONCLUSIONS

None of the cases tested presented any unusual difficulties. With a sensible introductory explanation of the test about to be performed, the children offered their complete cooperation. The amyl nitrite test was shown to be of absolutely no use for accentuating and differentiat-

ing precordial murmurs. In fact, in the majority of organic cases the murmur disappeared with amyl nitrite only to return and become accentuated following the epinephrine. This rather agrees with the findings of Kahler and is contrary to the opinion of Morison. Our explanation for these phenomena appears rather logical. Evidently the amyl nitrite merely serves to accelerate the pulse but at the same time decreases the force of the cardiac contraction, with a consequent disappearance of mild organic murmurs. The epinephrine, on the other hand, as shown by Hume,[15] Koppanyi,[16] Brodie and Cullis,[17] Wiggers,[18] Lewis and Hewlett,[19] exaggerates the force of the cardiac contraction with a consequent increase of eddies and a resultant intensification of murmurs which are due to an early organic valvular defect. Because of the dilatatory effect of amyl nitrite on the blood vessels, it is quite likely to be the reason for the appearance of functional murmurs after its use. The epinephrine test, on the other hand, has proved to be of inestimable value in determining the probable early cases of valvular heart disease: 47.8 per cent of an original group of Class E cases so tested five years ago are today classified clinically as organic heart disease. The epinephrine test also shows its usefulness in accentuating the murmurs of the truly organic case in which the diagnosis must be deferred because of an uncertainty in the timing and in locating the point of maximum intensity of the murmur in question. In these cases the murmur becomes so intensified and localized as to make the diagnosis most certain.

We offer the epinephrine test for heart murmurs in children not as a panacea for the absolute differentiation of organic heart disease from the functional, but rather, as Dwan[20] says, "As a practical office method of hearing the murmurs more clearly should they be present." We wish to assert ourselves now, just as we have done in the past, on the question of the significance of the murmur. It is our opinion that a great percentage of the soft murmurs are significant and that the moderate and loud murmurs are always significant. We agree with others in declaring that the murmur per se is of no importance in determining the functional capacity of the heart in question. However, we urge that it is most important to recognize the presence of an organic murmur because it usually signifies the presence of an infectious process, either latent or active, most likely rheumatic in origin, and which we all know has a most vicious tendency to recur. If we know that the case at hand is organic, we will necessarily be alert for any rheumatic manifestations. Only in this manner can we ever hope to conquer a most intractable condition. It is our concluding opinion that it is still preferable to err on the side of caution rather than neglect, acknowledging, however, that the psychic factors of the patient must be considered. Tact must be used in order to prevent the additional burden of a mental hazard to an acquired organic physical defect. It is interesting to note here that Osler once said, "If an individual discovered early in life that he was suffering from a chronic disease, the probability was that he would not

die of that particular disease, he would deliberately take care of himself in respect to the handicap, so as not to allow that disease to gain headway; some disease he did not consider might readily overwhelm him." With our present-day method of handling and treating the ambulatory cardiac patient the dread of informing the patient of his affliction is practically nil. The functional capacity and curtailment of activities of the child depend, of course, on the cardiac response and not upon the presence of murmurs.

## SUMMARY

The value of the subcutaneous injection of epinephrine 1:1,000 as a means of accentuating and differentiating the so-called functional cardiac murmur from the organic is discussed; a five-year clinical follow-up in a group of 32 children previously receiving this test being the basis. A new group of 37 children were given a similar test, using amyl nitrite in 12 for comparative effects. The epinephrine test is found most useful for intensifying the murmurs of the early cases of probable valvular heart disease and also in accentuating the murmurs of the definite organic valvular lesions. The similar use of amyl nitrite as recommended by others is found entirely wanting. Due to the fact that the authors find so large a percentage of children considered as having a functional heart condition, within a period of five years presenting the clinical signs of a recognizable organic cardiac lesion, they strongly urge the physician to be cognizant of the threatening importance of the cardiac murmur, even without the expected concomitant signs and symptoms of organic valvular heart disease.

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# TRENDS IN CHILD PSYCHIATRY

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## INTRODUCTION

CHILD psychiatry has developed in the last fifteen years from a study of delinquent children into a field concerning itself with the analysis and treatment of such behavior anomalies as develop not only in problem children, but in almost all children. It has broadened its base by the accumulation of added knowledge of normal mental and emotional development. It seeks to introduce mental hygiene concepts as an integral part of child care and education.

A factor important in shaping any particular clinic in which psychiatry for children is practiced is the relation that the clinic has to its community. Whether it be an independent unit, or a close associate of some social agency, or a function of a psychiatric department, this will influence not only its fundamental attitude, but also its whole point of departure, its personnel, its clientele. Classified roughly from this point of view, there are three main types of clinics functioning:

1. City-supported Child Guidance Clinics.
2. Psychiatric organizations serving social groups.
   a. Those working in relation to hospitals or as an integral part of pediatric clinics.
   b. Those working in conjunction with social-medical agencies.
3. Child psychiatric organizations in medical schools which are either within the pediatric department or affiliated with the psychiatric department. The tendency to teach the student child psychiatry and pediatrics simultaneously has increased in the last five years.

For purposes of a report it is convenient to group the organizations into two main types, namely "guidance clinics," which include the independent units, as contrasted with what we shall call the "psychiatric services," meaning those units which are connected with hospital, medical school, or social agency.

## CLINICAL MATERIAL

*Source of Cases.*—In guidance clinics there is a tendency for the percentage of juvenile court cases to be diminished in favor of cases referred by social agencies, schools, parents, and physicians. The last

From the Child Guidance Clinic of the Federation of Jewish Charities.
Read before the Pediatric Section of the California Medical Association at the sixty-fifth annual session, Coronado, May 25-28, 1936.

category is small, since the attitude especially of the older members of the medical profession is still not fully cooperative with the child guidance movement as such.

The psychiatric services affiliated with medical institutions obtain their material partly from the above mentioned sources, and, in addition, cases referred from the pediatric departments. The interest of the medical profession for cooperation is obviously better stimulated by this type of service on account of closer contact.

*Selection of Cases.*—In nearly all organizations the demand upon them is greater than can be filled. In guidance clinics a proper selection of cases is made through a committee of staff members who review the applications. In psychiatric services in connection with hospitals or social agencies, the physician determines after the first examination the degree of service appropriate for the specific case.

*Age Groups.*—Child guidance clinics have a large percentage of children in the teen age with school failures, in contact with juvenile courts, and with problems of adolescence. The psychiatric services on the other hand show a preponderance of children of preschool or first grades. This is due to the fact that pediatric departments become aware of early symptoms of abnormal behavior through their well baby or preschool clinics. The contact of such services with younger children seems to be of decided advantage since it places the accent on prevention through early discovery of behavior anomalies.

## STAFF

In child guidance clinics the basic team for the examination of full service cases consists of pediatrician or physician, psychiatrist, psychologist, and social worker. The psychiatrist may also make the physical examination, or there is a division so that the medical examiner takes over the psychiatric attention of the preschool group.

In psychiatric services the pediatrician or psychiatrist plays the main rôle. Then psychologists or social workers are called upon either routinely or only in those cases in which their services are appropriate.

When the psychiatric service functions in connection with a social agency, the social worker is the central figure. She directs the case to a physician in clinic, hospital, or private office and either consults with the psychiatrist in the absence of the patient or brings the patient to the psychiatrist's office. The psychologist is not routinely called.

## FORMS OF SERVICE

With the Chicago Institute as an example of the services offered by *guidance clinics,* the following forms of service may be distinguished:

1. Full clinic service includes study by full social history, a complete physical examination, psychologic tests, and psychiatric interview, and discussion by full staff meeting.

2. Special service is for less complex cases (mainly of mental deficiency or the question of it, advice regarding fitness for adoption, advice regarding exclusion from school or regarding commitment). A brief history covers pertinent topics. Physical examination is not done unless previously omitted or incomplete. Psychiatric interview is held with parent and child. Discussion in staff meeting follows.

3. Summary service is for urgent cases, for such cases as do not need a long-drawn-out work-up, or for patients who respond better to a more informal approach. The examinations to be given each of these patients are decided upon in the application committee meeting. Any additional necessary work-up is arranged by the examining physician. Ordinarily these cases are not discussed in the full staff meeting but informally among the various examiners.

4. Routine service is given to cases which are generally not urgent, especially those in which improvement through treatment seems dubious. Brief social histories are taken, and one or two examinations, perhaps psychologic and psychiatric, are made. Ordinarily there is only informal discussion among the various examiners. Wherever necessary, cases are transferred from summary or routine service to full clinic service.

5. Cooperative service: The policy of child guidance clinics varies in the problem of cooperative service. For instance, the Institute of Juvenile Research prefers its own social worker to make a case study and to attend to the follow-up treatment. On the other hand, the child guidance clinic in Cleveland has a considerable percentage of cooperative cases. There the responsibility for case work and follow-up treatment is given to the social worker of the social agency which referred the case in question to the clinic.

The services offered by *psychiatric services* may be discussed by taking the Cornell Psycho-Pediatric Clinic as an example. Here are found the following:

1. Consultation service, in which the psychiatrist examines the patient in the hospital or clinic and advises the pediatrician concerning diagnosis and treatment. The pediatrician retains full management. This group represents children in whom behavior problems or minor functional complaints are superimposed on organic conditions.

2. Cooperative service: The case is referred to the psychiatrist for examination. A conference between pediatrician and psychiatrist follows. The treatment of child and parent is undertaken under collaboration of pediatrician and psychiatrist. In this group are patients mostly with problems on the habit level, who require reeducation for themselves or their parents over a certain length of time.

3. Paedo-psychiatric clinic service: Patients are referred from pediatrician to psychiatrist for examination and treatment. This is done with the group of children having personality problems on a deeper level and requiring expert care.

*Child Psychiatric Hospitals.*—All types of organizations mentioned so far deal with out-patients. A small number of institutions admit patients into their walls for thorough studies. An example is the Child Guidance Home in Cincinnati. It is operated jointly by the Jewish Hospital and the United Jewish Social Agencies. The child is sent first to the pediatric department of the Jewish Hospital for a complete examination. If referred to the Guidance Home, the child takes his place in a family of fifteen. "In addition to the regular household tasks, that a child is normally required to do, manual training and extra curricular school work are given. During this period of observation, varying from two weeks to two months, the child attends the neighborhood public school where he is placed in a grade according to his mental capacity. The principal and teachers are informed regarding the nature of the child's problems, and their aid and cooperation are enlisted. In addition to the regular schooling, a teacher visits the Guidance Home regularly to coach the children and to give them any special instructions that may be needed. Psychiatric examinations and psychologic tests are also carried out at the Guidance Home." The child's social reactions both at school and at the Home are thus studied. Before a child is discharged, a conference of the Home staff with workers of interested agencies or parents is held in most of the cases. A careful follow-up with reexamination of the children in the Home follows. This type of work makes possible thorough study away from the influences of the previous environment and has the advantage or disadvantage of such a procedure.

## METHODS OF APPROACH

The method of approach to any given case is influenced by a variety of factors.

1. A first point is the route by which a child reaches the clinic. This may be through social agencies, through medical agencies, or through private individuals, parents, or physicians.

2. The expected work to be done may be diagnosis or diagnosis plus treatment.

3. Clinics may be organized independently or in relation to other agencies, as outlined above.

4. The emphasis of the work may or may not be on education of community, social agencies, school principals, members of various professions, students of medical schools, teachers' colleges, schools of social work, or lay groups, etc.

5. Child psychiatric institutions are still in the stage of transition. Their work started as a help to the juvenile courts, soon became necessary to social agencies and schools, and has recently become associated with medical institutions. In the course of growth, many technics have been developed, which are still not completely standardized.

There is no wonder that, with so many factors working, methods of approach to the case are varied. An attempt to classify these methods is difficult, but certain working procedures seem to represent real differences in trend, even though they have some features in common.

The typical child guidance clinic approach may be demonstrated by a description of the procedure in the Institute for Juvenile Research in Chicago. Here the initial history is taken by the social worker with special reference to human interrelationships and attitudes. This is followed by psychologic, medical, and psychiatric examination and staff meeting.

In psychiatric services, of which the Johns Hopkins Clinic may be described as an example, the *examining physician* takes the complete history in the following order: complaint; onset and evolution of difficulties; family and social history, including interpersonal relations in the home, family history of serious illness, character traits, peculiar social and economic features, home conditions, home economics, family recreations, estimation of personalities; personal history of the patient, including developmental data, history of habit formation and home management, personality traits; distribution of work, recreation, rest over twenty-four hours, school record; physical status; mental status, including behavior during examination and intelligence test, complaint as formulated by the child, attitudes toward family members, playmates; diagnostic reformulation stating summary of assets and liabilities of constitution, physique, intellect, emotion, and environment. The help of a psychologist and a social worker is employed only for the investigation of special problems.

The difference of these two methods of approach is evident. In the first method several specialists in their respective fields pool their findings and decide about procedure in group discussion. This set-up obviously can cope with many more cases than can the second method, by which only one problem can be attacked in one-half day's work. The second method has the advantage of collecting all data through one person who thereby gains a very intimate contact with mother and child. But he may get only secondhand information about the social aspects. The psychologic examination is limited.

A third method of approach is practiced only in the Child Guidance Clinic of Philadelphia, where no organized history is taken. Instead, the psychiatrist starts his treatment with the child in the first meeting; the social worker begins similarly with the mother. Facts pertaining to the history come out unsolicited. Medical examinations or psychologic tests are not routinely performed.

It is obvious that this time-consuming method cannot be applied in institutions with a heavy case load. The method presupposes also that children with medical problems and feebleminded children, as well as children with reading disabilities, are eliminated beforehand.

## METHODS OF TREATMENT

A pluralistic approach to the study of behavior problems in childhood implies a similarly pluralistic attack in treatment:

1. Medical treatment of all important organic factors involved.
2. Environmental manipulation, i.e., family, home, school, recreation.
3. Psychotherapy for child and relatives.

All three methods are used by all types of child psychiatric organizations. But one or the other method may be more or less available, or more or less prominent in the therapeutic attitudes of the staff. In general, it may be said that child guidance clinics with their close relationship to social agencies and with their heavy case load favor the second method with only limited consideration of the first and the third.

Psychiatric services connected with the hospitals may favor the medical aspects of treatment in combination with individual psychotherapy and environmental manipulation.

Some institutions (Child Guidance Home in Cincinnati, Child Guidance Clinic in Cleveland) are especially active in endocrine therapy of behavior disorders.

A few words on psychotherapy may be appropriate. The choice of the psychotherapeutic technic depends upon many different factors, mainly the personality and treatment philosophy of the therapist, the degree of the emotional disturbance of patient and mother, the time available, the qualifications of the social worker.

There is no uniform psychiatric philosophy existent. Psychobiology, as exemplified by Adolf Meyer's teachings, Freud's, Adler's, and Rank's teachings are the bases of the four main schools of thought. The personal choice of psychiatrist and psychiatric social worker, or a more or less "official" clinic policy determines the handling of the patient.

This division of opinion is not so noticeable in the treatment of behavior problems, which are supposedly superficial disturbances of personality. In complexes or conflicts of less than neurotic level the methods of suggestion (reassurance or encouragement) and of catharsis (talking out) are employed everywhere. Nearly all psychopediatric institutions use the psychotherapeutic aids of occupational and recreational programs and training in basic habits of regulated living on the didactic level of treatment.

But in problems involving deep personality disturbances, where psychoanalytic therapy of some kind is essential, many controversial issues appear, of which the following are examples:

Should the mother be treated? The stress within the child is frequently caused by an emotional upset of the mother. Should mother or child or both be treated by psychoanalytic methods?

How should treatment proceed? Should mother and child be treated by the same therapist? In many child guidance clinics and psycho-

pediatric clinics this is done, but in the child guidance clinic of Philadelphia, for instance, the psychiatrist treats the child and the social worker treats the mother.

What is the lower age level for analytic treatment? Many clinics put the lower age level of direct treatment at seven to ten years. But in several institutions children in the preschool age are analyzed with play technics which give opportunity to dramatize and release emotional conflicts.

## EDUCATIONAL ACTIVITIES

*Child guidance clinics* serve as training centers for psychiatrists and social workers. Students of schools for social work spend there a part of the period allotted for field training or work as postgraduates on special fellowships. Psychiatrists stay for one or two years as fellows or visit the clinics over periods of from three to six months. Staff members serve as teachers in various schools of social work, education, medicine, and nursing.

In addition, lectures are given to parent-teacher organizations, social agencies, school-teachers, and high school students.

Staff members serve frequently on committees of welfare organizations.

*In child psychiatric clinics* the teaching contacts are mostly with the medical and nursing profession, especially with medical students, house officers, and attending hospital staff.

*In child psychiatric clinics connected with social agencies,* the main teaching activity is devoted to social workers.

These manifold educational activities show clearly the far-reaching influence of child psychiatric organizations upon dissemination of mental hygiene concepts into the whole community.

## CLINICAL CHILD PSYCHIATRY IN RELATION TO PEDIATRICS

The pediatrician meets in his daily work a considerable number of children who show physical manifestations of emotional disturbances. His close contact with the family and its setting gives him the opportunity to recognize them early and to influence the causative factors in the interplay of personality and environment. The pediatrician has now the knowledge at hand to influence the routine care of the child from birth to maturity in the terms of mental health. Therefore, he should be able to devote his attention to the emotional as well as to the physical problems for prevention and treatment.

This attitude will enable the pediatrician to cope with the majority of the everyday psychiatric problems of childhood. A relatively small number of children with deeper emotional disturbances have to be turned over to the psychiatrist for diagnosis and treatment.

The tendency of bringing the psychiatric viewpoint into pediatrics instead of turning pediatric-psychiatric problems, in general, into the psychiatric departments has brought the child psychiatrist into the pediatric department for close cooperation. This is a reason why child guidance clinics and child psychiatric services have been established within the children's departments of medical schools and general hospitals in recent years.

SUMMARY

1. Organization and activity of child guidance clinics and pediatric-psychiatric services have been reviewed.

2. The accent in child psychiatry has shifted, as it has in medicine generally, from treatment to prevention.

3. An important phase in the recent development of child psychiatry is the organization of child psychiatric services within pediatric departments. Here behavior problems are handled, together with all the other problems of children.

4. The pediatrician should be the main factor in the field of prevention and treatment of behavior problems in childhood.

POST AND SCOTT STREETS

# American Academy of Pediatrics

## Proceedings

SIXTH ANNUAL MEETING OF THE AMERICAN ACADEMY OF PEDIATRICS

KANSAS CITY, MO., MAY 11 AND 12, 1936

### Round Table Discussion on Passive Prophylaxis Against Infection in Childhood

Chairman: John A. Toomey, M.D., Cleveland, Ohio.
Assistants: Archibald L. Hoyne, M.D., Chicago, Ill.
Sidney D. Kramer, M.D., Brooklyn, N. Y.
Edgar E. Martmer, M.D., Detroit, Mich.
Edward B. Shaw, M.D., San Francisco, Calif.

#### Passive Prophylaxis Against Pertussis and Chickenpox

E. B. Shaw, M.D.

The success which has attended the use of convalescent serum and similar agents for protection against measles and for modification of this disease and the accurate information which has accumulated regarding this procedure naturally suggest that similar measureas might prove effective against many other of the acute infections, especially those due to viruses. The use of convalescent serum for passive protection against chickenpox and whooping cough has been applied to some extent and reported with varying degrees of success by different observers. The prophylactic use of human convalescent serum is essentially devoid of unpleasant reactions which accompany the administration of horse serum, and the duration of immunity thus conferred by homologous serum is more prolonged than that conferred by heterologous serum in the diseases in which immunity may thereby be transferred. The use of human serum, however, involves the clinician with somewhat greater responsibility regarding its collection and storage and in safeguarding against the possibility of thus transferring to the patient some other communicable disease than is the case with commercially prepared horse serum.

There is no practical method by which human convalescent serum can be assayed for its content of immune bodies. In contrast to commercially prepared serum, convalescent serum is not the result of hyperimmunization and is usually not extremely potent. Obviously the immune properties of convalescent serum are subject to great variation in different patients, and the protective value thereby differs greatly in various infectious diseases. The precise value of convalescent serum as a prophylactic can be determined only by clinical experimentation with a particular disease and by the results of carefully controlled and studious observation of patients; it cannot possibly be deduced by a simple analogy to the protective action of measles convalescent serum.

Kereszturi, Hauptman, and Park[1] report the use of convalescent serum in hospital practice for protection against several of the common contagious diseases of

children with varying success. They express the very cogent opinion that, unless control patients are observed simultaneously with treated patients, one cannot determine the value of convalescent serum. It is a matter of extreme difficulty to carry out clinical experiments under conditions which simulate to any degree the accuracy of a carefully controlled experiment with laboratory animals, but in order to provide information regarding the practicability of prophylaxis by means of convalescent serum against any specific infection it is essential that the conditions of laboratory experiments be reproduced as closely as possible.

It is quite certain, however, that the patients comprising a group to be studied represent only one of several variables which must be controlled. The susceptibility of the patient to infection is modified by age; in infancy susceptibility is high in some infections and is very low in others; early childhood represents a stage of increased susceptibility to most infections; advancing years usually reduce susceptibility through spontaneous immunization from exposure, subclinical infection, and increase in nonspecific resistance. Increase in the size of the patient may occasion the necessity for increasing bulk of the infecting dosage to which the patient must be exposed and undoubtedly increases the amount of serum necessary for his protection. In an experimental series there are certain to be differences in the intimacy of exposure to infection; minute amounts of infective material acquired through casual exposure may result in much milder attacks of a disease than are occasioned by massive exposure and consequent acquisition of large amounts of the infecting organism. Massive exposure to an infection may even occasion disease in the presence of partial immunity, as illustrated by the relative frequency with which mothers acquire second attacks of whooping cough from infected children. The susceptibility of the patient is influenced not only by his age, size, and intimacy of exposure but by factors which may affect his general well-being, such as antecedent or accompanying infection, injury, climate, exposure, and other physical and physiologic agencies. It is impossible for any group used as a clinical study to be subjected to the same degree of control as a laboratory experiment. A mathematically valid study of such a series would necessitate the impossible expedient of inoculating healthy individuals with a similar dose of infected material (as was done in one experiment regarding the etiology of whooping cough).[2]

Another variable factor affecting the efficacy of prophylaxis is the time interval elapsing after exposure before the administration of convalescent serum. The influence of this factor has been accurately studied with regard to measles, but there is evidence that it is important in other infections as well.

The potency of the convalescent serum used is of great significance to the validity of a clinical study. Human serum lacks the hyperimmune properties of the serum of immunized horses, but there are also quantitative differences in serum immunity production in different individuals just as there are in different horses. The interval after attack at which serum is collected influences its potency; a maximum is reached some time after defervescence, from which there is a variable rapidity of decline in different individuals and in different infections. The persistence of a considerable degree of potency which may be present long after an attack of measles cannot be confidently anticipated in other infections. The intensity of infection seems likely to influence to an unpredictable extent the amount and persistence of immune substances. It would seem desirable that the dosage of convalescent serum administered to the patient be chosen with some regard to its potency and with respect to the size of the patient, the degree of exposure, etc.

To say what has been accomplished with a single serum in the protection of an individual patient cannot possibly comply with these controlled conditions. In order to pursue an acceptable study of this problem, it is necessary to study a sufficiently large group of cases, to provide adequate controls, to administer serum at a definite period after exposure, to use pooled serum obtained at a definite and

preferably early period of convalescence, and to administer to each patient an amount of serum sufficient to produce a presumably maximum effect. Except for studies on measles and some few other notable exceptions, clinical studies regarding the prophylaxis of the common infections of childhood have been pursued with little regard to these criteria.

*Whooping Cough.*—The literature of whooping cough prophylaxis by means of convalescent serum has been well reviewed by Bradford[3] and by Kereszturi and her associates.[1] The spontaneous variability of whooping cough is so great that, even if factors of exposure—dosage, time, and serum potency—were kept constant, a large number of case observations would be required for an adequate field test of effectiveness. In reported observations there has been so little constancy in these factors that it is doubtful if any one series or even the aggregate of all reports present really valid evidence. Kereszturi controlled her series carefully, but had no occurrence of the disease in either treated patients or untreated controls. Bradford conducted critical studies of a comparatively small group using whole blood of adults who had whooping cough in childhood as well as serum from recent convalescents. Bradford's series is too small for conclusion, but he presents a clinical opinion which summarizes his own experience and coincides with the majority of the most careful reports. He believes that convalescent serum, and probably the blood of adults who have had whooping cough in childhood, contains active principles capable of modifying the course of the disease if applied early in the incubation period before the onset of even the early catarrhal stage of infection. It will be difficult to determine the final truth of this opinion, but there is sufficient need in many cases for the prevention of severe whooping cough that it should be worth while to collect serum for use under conditions of intimate exposure in patients in which occurrence of the disease would be especially undesirable. There is no method of biologic assay of serum, but, if stores of serum were collected early in convalescence and applied to cases early after exposure, it should be relatively easy to determine if anything can thus be accomplished and having accurately established this fundamental point comparative studies could be made regarding the value of blood obtained from immune adults, the utility of applying serum later in the disease, and the effect of increasing dosage at various stages.

*Chickenpox.*—Chickenpox is in general a very mild infection, and prophylaxis against it is seldom desirable. An exception to this general statement is found in institutions in which it would often be desirable to protect because of one's medical responsibility to the patients and because of the undesirability of prolonged quarantine of a ward. Aseptic nursing in a children's ward often protects against the simultaneous development of secondary cases of chickenpox among all of the inmates, but the slightest error in technic often permits many generations of secondary attacks. Chickenpox is, furthermore, sometimes peculiarly severe in the convalescence of other infections, and for this reason it would sometimes be desirable to confer passive protection at such a time if this were possible.

Gordon and Meader[4] and Kereszturi and her associates[1] have reviewed the literature of chickenpox prophylaxis, which is not extensive, most thoroughly. Kereszturi was unable to draw any conclusions from her experience with the disease. Gordon reports the study of a series of ward exposures in which prophylaxis was attempted and in which many of the experimental variables were adequately controlled. Gordon did not directly control his patients, but there is some control effect in the comparison of different groups in which different procedures were tried. He presents several conclusions which are well supported by his experience and by the reports of other observers. These may be summarized as follows: The blood of convalescents contains protective immune substances against the virus of chickenpox. Serum immunity production is apparently poor in infants and young children, is better in older children and adults. Serum immunity is high immediately following attack

but reaches a low point from five to ten months after an attack; accordingly blood serum for prophylaxis should be withdrawn within one to two months of an attack. Protection is usually secured in children by the administration of 10 c.c. of blood serum given within twenty-four hours and not later than the third day following exposure. Although immunity is usually conferred, approximately 10 per cent of cases escape protection and develop the disease in unmodified forms. Passive immunity is brief but apparently longer than that conferred by heterologous serum; twelve patients reexposed to secondary cases resulted in two clinical cases, one boy was apparently protected against three exposures within an interval of forty-seven days.

None of the published observations answers the question of what can be accomplished with larger doses of convalescent serum later in exposure, or of what can be accomplished with larger doses of adult serum, or if it is possible to obtain complete protection in a series by a sufficiently large dose of serum.

A single observation of our own illustrates the lack of correlation between chickenpox and measles regarding the protective value of large amounts of adult blood. A ten-year-old boy suffering from scarlet fever received at intervals transfusions of 250, 300, and 300 c.c. of blood from two donors. Within less than two weeks of the last transfusion he developed chickenpox from ward exposure. These transfusions would almost unfailingly have protected him against measles but failed perceptibly to modify the course of his chickenpox.

This disease is ordinarily mild; protection by any known method is far from absolute; there is accordingly infrequent necessity of using this method for prophylaxis. A considerable minority of cases fails to be protected, and those protected against the original exposure may become susceptible to reexposure to secondary cases. It would seem not to be at all obligatory to attempt the protection of children's wards during outbreaks.

*References*

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DISCUSSION

DR. KRAMER.—Are there any methods of titration for pertussis immune serum?

DR. SHAW.—There is no absolute method. One measures the effect by clinical trial.

CHAIRMAN TOOMEY.—Freshly isolated phase I organisms when injected into rabbits produce a serum with an agglutinin titer value as high as 1:40,000. Yet such serum gives no protection to guinea pigs, for when protected and nonprotected animals are injected with Type I organisms the protected animals die sooner than do the unprotected controls.

DR. SHAW.—I would conclude by stating that convalescent pertussis serum may be of some value in prophylaxis, although this has not been proved and state also that there is no evidence that convalescent serum is of any value in chickenpox. In fact, in my opinion it is a question whether or not it is a practicable procedure to even inject exposed susceptible children.

CHAIRMAN TOOMEY.—Dr. Shaw's remarks are timely. He points out the danger of drawing too many conclusions from isolated experiences. He stresses the need of controls and the fact that all diseases have a natural history of their own. Every clinician should read his remarks before talking about the beneficial results obtained from the use of any therapy.

Convalescent serum has not been very helpful in controlling the spread of chickenpox in our wards.

I thought that whooping cough convalescent serum might be of value in the treatment rather than in the prevention of whooping cough, but the evidence is questionable.

DR. HOYNE.—I question the value of chickenpox serum for prevention even when as high as 20 c.c. were given.

DR. M. G. PETERMAN (MILWAUKEE).—I have tried immunization with the vesicle fluid of chickenpox lesions and found it worthless.

DR. J. F. SANDER (LANSING, MICH.).—What about the danger of transmitting the disease when fluid from lesions is used?

CHAIRMAN TOOMEY.—One year chickenpox broke out, and in the entire contagious disease hospital we vaccinated 91 children (against chickenpox) with the contents of varicella vesicles, and in due course 88 of the 91 children came down with the disease.

DR. M. L. BLATT (CHICAGO).—In an orphanage housing 250 children I have used normal human serum in those exposed to chickenpox, and 10 c.c. seemed to give protection for eight days; but, if a second case developed in the house, the disease would become epidemic. There were four cases of gonococcus vaginitis; convalescent serum was given and the children were protected for three months—though repeatedly exposed.

DR. SHAW.—Massive doses are required for prophylaxis; the longer the interval after exposure, the larger the dose required. I do not believe that varicella vesicle fluid (active immunization) is of any value, for, when I tried it, the children developed the disease anyway. In general, one could say a children's ward is a poor place to evaluate the worth of material. It can be done well only in private practice.

## Convalescent Scarlet Fever Serum for Passive Immunization

Archibald L. Hoyne, M.D.

The need for some satisfactory method of passive immunization against scarlet fever is apparent. This requirement is particularly evident when the scarlet fever patient remains in a home where there are susceptible children. Even when the original patient is removed to a hospital, there is no assurance that other members of the family may not be in the incubative stage of the disease as a result of exposure. In this connection, it is well to keep in mind that scarlet fever is not uncommon among adults.

In a published report we have cited several groups of multiple cases occurring in the families of children admitted with scarlet fever at the Chicago Municipal Contagious Disease Hospital. From January, 1932, to July, 1934, there were 1,771 such multiple cases. This total represented 730 families in which scarlet fever was transmitted in the home by direct contact from a known source.

During the past few years, our hospital figures have indicated that there has been a progressive increase in the number of multiple cases of scarlet fever. For example, in 1932 there were 488 multiple cases; in 1933 the number was 761; and for the first six months of 1934 the total reached 522. Had a reliable prophylactic been available when the first case of scarlet fever developed in each of the 730 families concerned, some lives, considerable money, and a great deal of time would have been saved. Furthermore, the inconveniences attending quarantine would have been avoided by those who were protected.

Convalescent scarlet fever serum has been used for a number of years with the intention of conferring passive immunity. In some reports of its administration, the

value of its protective properties is not clearly proved. Since the question of susceptibility of the contacts was not always determined, failure to contract scarlet fever could not in every instance be attributed to serum injection. It is for this reason that both Degwitz' and Meader's results are somewhat uncertain. On the other hand, the Dicks and Gordon showed conclusively the protective qualities of convalescent scarlet fever serum. The latter reported 92 per cent protection in a group of Dick-positive student nurses who reported for duty in the Herman Kiefer Hospital. Each of the 112 nurses was given 15 c.c. of human convalescent scarlet fever serum, intramuscularly, before entering the scarlet fever ward. Eight nurses contracted scarlet fever, but apparently the disease was modified. In fact, it was Gordon's belief that had it not been that these nurses were under close observation, a diagnosis of scarlet fever would have been missed.

We have reported on the inoculation of 862 home contacts in which 97.2 per cent did not develop scarlet fever. This series, like some of the others referred to, is vulnerable in respect to displaying the actual efficiency of the serum. Although none of the number gave a history of having had scarlet fever, susceptibility as indicated by the Dick test was not determined. There were, however, 83 Dick-positive hospital contacts who received convalescent scarlet fever serum. For these, protection was indicated in the 95 per cent who did not develop scarlet fever.

Human convalescent scarlet fever serum is a reliable prophylactic agent. If administered to a susceptible individual within twenty-four hours of exposure, it is almost certain to convey a passive immunity. If given at a later time, it is likely to modify if it does not prevent scarlet fever. Immunity when established by the injection of convalescent serum is not likely to endure more than ten days to two weeks. Therefore, if there is continued exposure or a second exposure after ten days, the dose should be repeated. Because it is a human serum, no unpleasant reactions need be anticipated when a second or third dose of convalescent scarlet fever serum is administered.

Usually 10 c.c. is sufficient for a prophylactic dose of convalescent scarlet fever serum, although a larger amount will do no harm. The serum should be warmed to body temperature. The outer muscles of the thigh offer a good site for injection. If the contents of the syringe are expelled slowly into the muscle, practically no pain will be felt.

In some of the larger cities serum centers are maintained. Detroit, Chicago, Cleveland, and Milwaukee are among the places which provide human convalescent serum to physicians who desire to use it.

At times it may be difficult or impossible for the physician to secure convalescent serum for the immediate needs of his patients. Under such conditions, he may, if the circumstances seem sufficiently urgent, resort to the use of whole blood. The supply may be obtained from one of the parents of his patient. Preferably, the parent should have a history of having had scarlet fever or of being Dick negative. If whole blood is used for the purpose of passive immunity, about 30 c.c. should be injected deep into the muscle.

The secondary case of scarlet fever in a family is frequently much more severe than the primary case. This is a fact well worth considering when contemplating the advisability of attempting passive immunization of contacts.

## DISCUSSION

DR. C. A. EARLE (DES PLAINES, ILL.).—Does convalescent scarlet fever serum influence the Dick test when given susceptible individuals?

DR. HOYNE.—Negative Dick tests have been seen after the use of convalescent scarlet fever serum, but unfortunately there was no knowledge of what the Dick tests were preceding these injections.

DR. JOHN AULL (KANSAS CITY, MO.)—Does convalescent serum influence angina?

DR. HOYNE.—In my opinion, there is a marked improvement in throat conditions.

DR. J. V. GREENEBAUM (CINCINNATI).—How long does convalescent serum stay potent?

DR. HOYNE.—We find that it is still potent after a year in the ice box.

DR. SHAW.—How would you compare the horse serum antitoxin or antiserum and human serum?

DR. HOYNE.—Many object to the use of antitoxin as a therapeutic measure because of the reactions which follow its use. The new scarlet fever antitoxin of Lederle's gives but few reactions.

DR. KRAMER.—Should there be reactions to human serum, they are mostly due to a passive transfer of an allergic principle.

CHAIRMAN TOOMEY.—Human serum does not cause any immediate reactions, but I have seen maculopapular rashes come on from seven to fourteen days after its use. These rashes are fleeting in character, and appear like a mild erythema multiforme. There are no striking subjective or objective symptoms associated with it.

DR. J. E. DYSON (DES MOINES, IOWA).—Is typing necessary when human serum is to be used intravenously?

DR. HOYNE.—It is not absolutely necessary, but it may be advisable perhaps to type the serum against cells in cases in which intravenous injections are done. Gordon has shown a 92 per cent protection rate when convalescent serum was used prophylactically in nurses.

DR. E. G. HORTON (COLUMBUS, OHIO).—When serum is given intravenously, is it undiluted?

DR. KRAMER.—Is the preservative a causative factor in these late reactions?

DR. HOYNE.—The serum has been used undiluted "as is." I do not believe that preservative has much to do with reactions.

DR. MARTMER.—It may be of interest to know that in some work we have done, we have been able to change a Dick-positive individual to Dick negative by the use of convalescent serum. The reaction, however, is reversed in from nine to twenty-one days after the serum is given.

DR. ARTHUR F. ABT (CHICAGO).—If frequent Schick-testing creates immunity, is it not possible that frequent Dick-testing may produce immunity also?

DR. KRAMER.—I agree with Dr. Abt that frequent Schick-testing reverses positive reactions.

DR. SHAW.—We have never found evidence that frequent Schick-testing influenced the reaction.

DR. M. K. WYLDER (ALBUQUERQUE, N. M.).—Is this new product of Lederle's safe?

DR. HOYNE.—About 20 patients were injected with this new antitoxin without any reactions. The material is highly concentrated and purified. So far as I know, it is safe.

CHAIRMAN TOOMEY.—We also have injected 20 patients with the same material. Our previous reaction rate has been from 75 to 80 per cent with various scarlet fever antitoxins used. Since there was a 25 per cent reaction rate in our 20 cases with the new product, even though it is better, at least in our experience, it has not completely lost its possibility of reaction.

DR. KRAMER.—Is the Dick test a measure of immunity or susceptibility?

DR. HOYNE.—Of 800 nurses who were immunized at the Cook County Hospital, only one developed scarlet fever. It is perfectly possible to have scarlet fever without a rash and to have the complications of scarlet fever. These are passed as streptococcic sore throats. One may question the statement as to whether one merely desensitizes against the rash.

DR. ABT.—Do you use convalescent serum in these cases of streptococcic sore throat?

DR. HOYNE.—Convalescent serum may be used; the patients have improved.

DR. EARLE.—I have from 700 to 1,000 children in an institution, and I find that immunization is an invaluable procedure to check diphtheria and scarlet fever. Only two children who were Dick negative developed scarlet fever. Only two children likewise had such reactions that active immunization has had to be discontinued.

DR. MARTMER.—Dr. Toomey, in your experience does scarlet fever follow previous mastoiditis?

CHAIRMAN TOOMEY.—Rarely. It is the other way around: Mastoiditis follows scarlet fever. The point in discussion is passive prophylaxis, but, since active immunization has been touched upon, I just wish to say in passing that I think that it has definite value. All nurses with sore throats are admitted to our wards, and there has been no increase of streptococcic sore throats in this group in the past ten years.

DR. WYLDER.—Would you recommend active immunization for children of preschool age?

DR. HOYNE.—That may be the best time, since theoretically these individuals are supposed to have lost their passive immunity and have become susceptible.

DR. F. H. MAURER (PEORIA, ILL.).—What is the relative permanency of active immunization?

DR. HOYNE.—The evidence is not clear. Some claim seven years; most three years, at least. You cannot depend on passive prophylaxis after ten days.

DR. O. E. BARBOUR (PEORIA, ILL.).—It is my experience that the earlier you give scarlet fever toxin for active immunization, the less reaction you get. Would you give it before diphtheria toxoid?

DR. EARLE.—The younger the child the less reaction you get after immunization. I give it as early as fourteen months.

DR. G. H. FELLMAN (MILWAUKEE, WIS.).—Is it not a fact that the more severe cases of scarlet fever occur in those patients who have large tonsils and adenoids?

DR. HOYNE.—Yes.

DR. ABT.—What is the status of Veldee's detoxified antigen?

DR. J. P. LEAKE (WASHINGTON, D. C.).—This is a formalized preparation. It does not give perfect immunity and also may give reactions. It is in the state of experiment.

CHAIRMAN TOOMEY.—Bradford, of Rochester, has been experimenting with Ando's fraction of the scarlet fever toxin, but there is nothing definite to report at this time.

DR. F. P. GENGENBACH (DENVER, COLO.).—Would it not be better to take the tonsils out in the preschool period? Would it be impracticable to increase the number of doses and thus cut down the reactions?

DR. HOYNE.—It is always wise to have enlarged tonsils removed, and the preschool time is possibly as good as any. It is a question as to whether people would stand for an increased number of doses.

DR. KRAMER.—Has control series been observed in Chicago?

DR. L. M. EARLE (HOLLYWOOD, CALIF.).—Do you collect fasting blood?

DR. MARTMER.—Is there any danger when a second or third dose of convalescent serum is given? I thought that I had seen urticaria and serum reactions as a result.

DR. A. D. BIGGS (CHICAGO).—What dose of serum did you use? I have had success with 20 c.c. amounts.

DR. HOYNE.—A small amount of convalescent serum (human) given every ten days during intimate exposures will prevent the disease. I use 10 c.c., Gordon used 15 c.c., and Meader 7.5 c.c. I do not use antitoxin as a prophylactic.

DR. BLATT.—Cross-infection is a problem in any children's hospital. At Cook County Hospital, all patients admitted, whether medical or surgical, are treated as suspects and given 30 c.c. of whole blood. When a case of scarlet fever does happen to appear, all the children are Dick tested and have their throats cultured. All positive cases are given convalescent serum (human). As a result, Cook County Hospital infants' and children's wards have not closed for quarantine in over two years. In Chicago a serum center supplies convalescent serum. I believe that parent's blood has some value and is worth using when convalescent serum is not available.

DR. C. A. EARLE.—Scarlet fever is not so contagious; often only one case develops in a family. If a case develops in one of my families, I make Dick tests on all members of the family. Those who are positive I actively immunize by giving them the five doses of Dick toxin. I feel that immunity begins at once.

DR. BLATT.—Have you (Dr. Earle) had any scarlet fever in these cases?

DR. C. A. EARLE.—I cannot recall any cases.

DR. SHAW.—I feel that I would like to stress Dr. Hoyne's remarks about the return cases. I would like to ask Dr. Blatt if he would recommend the use of parent's blood in exposed cases without a test?

DR. J. I. DURAND (SEATTLE, WASH.).—It would seem that one would have to think of the danger of syphilis when using blood for prophylactic purposes.

DR. BLATT.—I have had only one accident as a result of blood injections, and this was due to the fact that there were in the hospital at the same time two children with the same name. I have never known malaria to be transmitted. I usually use the mother's blood.

DR. HOYNE.—Control is the way to stop the spread of the disease; quarantine will not do it. Often the second case from the home is not the one from the hospital case—but really a new case.

CHAIRMAN TOOMEY.—I wonder how practical is Dr. Blatt's procedure of culturing the throat. Most throats have streptococci.

DR. BLATT.—At least 40 colonies must be on a plate, hence the evidence is relative. In short, the culture must be very positive as it were.

### Passive Immunity Against Encephalitis, Mumps, and Erysipelas

John A. Toomey, M.D.

Hess withdrew blood from patients who had had mumps within two years and injected from 6 c.c. to 8 c.c. and thought that he had protected susceptible children who were exposed. Regan injected from 2 c.c. to 4 c.c. of blood serum withdrawn from ten to twenty days after mumps started and felt that it protected if given before the seventh day after exposure. If given late in the incubation period, orchitis may be prevented. This is probably the most practical time for injection. Others have injected as high as from 10 c.c. to 20 c.c. of serum to protect and to prevent orchitis. Teissier, quoted by Shamberg and Kolmer, observed 23.29 per cent cases of orchitis in a series of 172 boys who had no serum and only 8.13 per cent in 172 boys who had the dose mentioned above. There seems to be some evidence that convalescent mumps serum may prevent orchitis if given after the onset of mumps and may actually prevent the disease in a susceptible child if given early enough after exposure. From 10 to 20 c.c. of serum should be given intramuscularly to be of value.

*Erysipelas.*—From 10 to 15 c.c. of concentrated erysipelas antitoxin has been recommended to be injected intramuscularly into exposed children. Since, in our hands at least, erysipelas antitoxin does not stop the spread of the natural disease when used therapeutically, since even an attack of the disease is apparently not followed by much immunity, and since patients actually seem more susceptible if they have been once attacked, it hardly seems logical to expect that serum would prevent the disease in others. Situations arise, however, as in surgical floors, where one or more cases may break out. It may be to the best interests of the physician to try to prevent any spread of the disease by the use of serum. At least, we have the consolation that, if it does no good, it will not do much harm since for some unknown reason it is not usually accompanied by the severe serum reactions seen when other antitoxins are used. There are no accurate data, and hence no definite conclusions can be drawn as to protection. I feel that, if exposed children wash their hands well with plain soap and water each time a patient is touched and if they refrain from scratching themselves, they will have nearly complete protection.

*Encephalitis.*—Convalescent serum has been used in encephalitis as well as anti-influenzal serum. The morbidity to this infection is low, and the chance for contraction minimal even to a person exposed. The evidence would not lead us to endorse the use of manufactured serums. Perhaps convalescent serum may prevent the infection from occurring in susceptible persons, but I know of no way of determining its efficacy.

We do not encourage its use in passive prophylaxis, although there may be some value in its use as a therapeutic measure.

#### DISCUSSION

DR. BARBOUR.—Would not early smallpox vaccination prevent postvaccinal encephalitis?

DR. LEAKE.—The number of cases of encephalitis that have occurred in the United States is negligible considering the number of individuals vaccinated. We have learned by experience that even this small number may be cut down practically to zero if the primary vaccination is given early, i.e., during the first six

months. It is better possibly to give smallpox vaccination first and then to follow it by diphtheria immunization. There is, as you know, evidence of nonspecific enhancement of immunity during the process of immunization.

DR. SHAW.—It is our experience that infants immunize poorly against diphtheria toxin.

DR. LEAKE.—Immunization against diphtheria would be better done at a later date, about one year.

DR. GENGENBACH.—Does vaccination interfere with immunization against diphtheria?

DR. LEAKE.—No.

DR. HORTON.—Do you use one or two doses of diphtheria toxoid to immunize actively?

DR. HOYNE.—I use two doses and occasionally three. I question the value of convalescent serum in the prophylaxis of erysipelas. I think that it is valueless.

DR. KRAMER.—The use of any convalescent serum is likely to be misused. It may even cause us to miss an opportunity to study a disease. Good control studies should be made when using serum. Such information is now being gathered at serum centers. At present there is too much talk and little concrete information.

DR. PETERMAN.—These serum centers opened with a flare, accompanied by many false statements in the press; I think more harm than good may be done by indiscriminate use of serum. We question the value of a number of procedures now. Why add more? I feel that the value of serum will have to be settled in institutions since I feel that the reports coming from the outside are valueless.

CHAIRMAN TOOMEY.—Concluding this part of the discussion, I would state that the evidence does not favor the use of convalescent serum in either erysipelas or encephalitis, but it may have some value in mumps. Because I feel that erysipelas antitoxin neither stops the disease spread nor modifies the disease itself, I do not see how I could recommend its use as a prophylactic. The disease appears in patients with plenty of antitoxin present at the onset of the condition, in individuals who consistently have a negative Dick test, in individuals who no sooner are well than they may get another attack. We are now accumulating evidence to show that erysipelas is a disease which occurs only in individuals who have been previously infected with streptococcus infections, evidence which shows that the individual is left immune. This disease then is really nothing more than a giant local allergic manifestation to the entrance of organisms and their products, against which the individual already has plenty of active immunity in the adult and passive immunity in the child.

### Passive Immunity Against Measles and Diphtheria
Edgar E. Martmer, M. D.

*Prophylaxis of Measles.*—The modification or prevention of measles is recognized as a desirable procedure particularly in the case of small infants, weaklings, and children under five years of age.

The selection of individuals in which it is desirable to so modify an attack of measles or prevent it is entirely dependent upon the health of the individual, the possibility of his contracting complications, as well as where he lives.

There are several methods available for the prevention or modification of measles: convalescent serum, 4 to 10 c.c.; adult immune serum, 15 to 30 c.c.; convalescent whole blood, 10 to 30 c.c.; adult immune blood, 15 to 50 c.c.; placental extract, 2 to 6 c.c.

All of these preparations will modify or prevent the development of the disease. The degree of success attained by the use of these various agents is dependent upon several factors. Among the things influencing the degree of value of these materials are (1) potency of material employed, (2) dosage, (3) time of administration, (4) degree of exposure, and (5) immunity of individual exposed.

In an analysis of any immunizing program consideration must be given to the degree of exposure and the duration of such exposure.

Karelitz and Schick have shown that hospitals and institutions are usually inadequate for the study of measles prophylaxis because of the variations in the degree and length of exposure. They likewise demonstrate that the percentage of protection obtained in the home is in proportion to the hygiene of that particular home. The better the hygiene and care exercised, the more likely a satisfactory result will follow the use of prophylactic measures.

In addition, it was shown by these same authors that in homes of poor hygiene the percentage of protection secured was in direct proportion to the dosage of serum. The larger the dose the better the protection afforded.

Because of the varying conditions under which the various studies of the value of methods of preventing or modifying measles have been carried out it is difficult to compare the results. However, a review of the literature suggests that Table I is a reasonable estimate of the value of the various agents.

TABLE I

| | TOTAL CASES | COMPLETELY PROTECTED | MODIFIED MEASLES | FAILURES |
|---|---|---|---|---|
| Adult serum | 584 | 329 (56.4%) | 139 (23.8%) | 116 (19.8%) |
| Convalescent serum | 1,627 | 1,227 (75.4%) | 273 (16.8%) | 127 ( 7.8%) |
| Placental extract | 1,341 | 959 (71.5%) | 321 (23.9%) | 61 ( 4.6%) |

From a study of this table one would be inclined to make the deduction that the first method of choice was placental extract, with convalescent serum second, and adult blood a relatively poor substitute for either of the first two mentioned.

It would seem that the figures for adult immune serum and placental extract should be more nearly the same when we consider that at least a portion of the placental extract is in fact adult serum. The probabilities are that, if the dosage of adult serum and placental extract were equal, the results would be more nearly alike. Tissue extracts in placental serum are probably responsible for reactions which have accompanied their use.

Aging the extract seems to influence favorably the reactions which follow its use.

Unfortunately most of McKhann's cases (in which placental extract was used) were treated in institutions where the degree of exposure is relatively less than when the same procedure is carried out at home.

In addition, no figures are available so far as I know giving the comparison between placental serum and placental extract.

The method of testing potency employed in the commercial preparations now available is either the modification of measles in institutional cases or the determination of the diphtheria antitoxin potency of the extract. Both of these methods are unsatisfactory. Diphtheria antitoxin potency is not a good yardstick to draw conclusions as to the ability of a serum to modify measles. Likewise, the individual variations in degree of susceptibility must be taken into consideration, the average child in institutions not being comparable with the protected child in the home encountered in private practice.

In the light of our knowledge at present, it would seem that the most useful agent we have for the prevention or modification of measles is convalescent serum. The advantage of placental extract over adult serum or adult whole blood would seem to be (1) availability, and (2) a more standard mixture.

## DISCUSSION

DR. GREENEBAUM.—Is convalescent serum of value in diphtheria?

DR. MARTMER.—Diphtheria antitoxin is so potent and reliable that it would seem useless to give convalescent serum when we have this material.

DR. GREENEBAUM.—I would like to have the subject of passive prophylaxis of measles by placental extract discussed. We get a lot of reactions with this material; I would like to know particularly about oral immunization.

CHAIRMAN TOOMEY.—In the county where you cannot see your patients often, you may give 1,500 units of diphtheria antitoxin to exposed children, but I do not see the value of such procedure in an urban practice where patients are seen more frequently.

QUESTION FROM AUDIENCE.—Is there a new antitoxin for diphtheria? I have hesitated to use antitoxin because of the possibility of sensitizing the patient. Will the new antitoxin prevent this?

CHAIRMAN TOOMEY.—Lederle has an antitoxin which they claim has been purified to the extent that all material causing reactions has been removed.

DR. S. H. ASHMUN (DAYTON, OHIO).—Placental material has given reactions in my patients. I have used adult serum with good results.

DR. SHAW.—I would suggest caution in the use of this new material; one should select cases carefully. I sometimes question the value of producing modified measles. Are we producing immunity?

CHAIRMAN TOOMEY.—I have seen second attacks in children thus immunized.

DR. KRAMER.—Second cases can occur in children. It may be a familial affair.

DR. MARTMER.—I would state that it would seem the best practice never to give diphtheria antitoxin when contact can be made frequently but always when the case cannot be followed (1,500 units). I have had reactions from placental extract and would prefer convalescent human serum in the prophylaxis of measles. From a practical standpoint I think children just passed school age should be allowed to get measles in the summertime, and I protect only the tuberculous child.

DR. R. CANNON ELEY (BOSTON).—The results in 2,133 patients who have received placental extract (immune globulin—human) in an effort to obtain modification or prevention of measles are of such a nature as to warrant the continuation of this procedure as an effective means of obtaining passive prophylaxis against measles. I cannot agree with Dr. Martmer in the statement that the results obtained with adult immune serum and placental extract are the same; in a group of 584 patients who received adequate amounts of adult serum for modification or prevention, 23.8 per cent were modified, 56.4 per cent were protected, while failures occurred in 19.8 per cent; of 1,341 patients who received placental extract for the same purpose 23.9 per cent were modified, 71.5 per cent were protected, while failures occurred in only 4.6 per cent.

The effectiveness of the extract may be influenced by several factors such as potency, degree of exposure, time of injection, age, and size of the patient. Needless to say, the uniformity of the results, i.e., modification or prevention, depends upon the same factors. Standardization of dosage has been based on the nitrogen concentration of the active fraction and not upon the presence of diphtheria antibodies, as it has been repeatedly shown that the content of measles antibody and of diphtheria antibody are not parallel. Karelitz and Schick have pointed out the influence that different types of exposure may exert on the appraisal of any prophylactic procedure employed in the treatment of measles. These factors had been duly considered in appraising the results obtained with placental extract, and, if one will

refer to the publications of McKhann and others, he will find the observations on the effectiveness of the extract divided into "intimate exposures" and "casual exposures."

The oral administration of the extract has been shown to reverse a positive Schick or Dick test, but it has not been advocated as a type of treatment in either diphtheria or scarlet fever. Nor has placental extract been suggested in the treatment of acute poliomyelitis, although the presence of antibodies in the extract has been demonstrated.

DR. MARTMER.—Children who get modified cases of measles may not develop immunity, and they may get a second attack after a subsequent exposure. There is a question in my mind as to whether season has something to do with modification. I do not see much modification when the material is used in late spring and early summer, but I have seen modification when the material was used in the early spring and late winter. Since convalescent diphtheria serum has only 4 units per cubic centimeter, the quantity that we would have to use to protect passively would be too large to be of any practical use.

## Passive Prophylaxis Against Poliomyelitis

Sidney D. Kramer, M.D.

I should like to take this opportunity to review the problem of prophylaxis in poliomyelitis and attempt to evaluate both the experimental data and the results of several earnest efforts that have been made to apply specific prophylaxis in children. Let us first consider the reagents we employ in dealing with the experimental disease.

The virus of poliomyelitis has certain differentiating features from other viruses pathogenic to man: First, it is a virus of low infectivity. As compared with other viruses the average infective dose required to produce the disease in the susceptible animal is much larger than that of other viruses, notably, yellow fever. Second, it is a virus with low antigenic properties. The injection of relatively large amounts of the virus is required to induce an immunity at all comparable to that resulting from a frank crippling attack of the disease. In common with most viruses the antigenic response to poliomyelitis virus is a direct function of its virulence and the degree of its infectivity.

A number of us have, furthermore, presented data that suggest there exists in nature multiple strains of the virus that evince specific and different antigenic properties. While working with three strains (an Australian strain, a strain from New Haven, and our laboratory stock strain), we found that the immunity resulting from an attack of the disease was specific to each of the strains. We had two animals immunized against two of these strains, which, resisting their own virus intracerebrally, developed poliomyelitis when inoculated with these other strains. Furthermore, the serums of these animals neutralized the virus of the other two strains only after they had passed through a second and third attack of the disease, respectively.

There is strong experimental and epidemiologic evidence that so-called neutralizing substance present in the serums of animals or human beings who have passed through an attack of the disease, or in the serum of animals which have been actively immunized against it, is specific. The fact that the serums of normal monkeys regularly do not contain this substance and that the serums of essentially all animals and human beings who have passed through a frank crippling attack of the disease do contain it strongly suggests the specificity of this substance. Furthermore, Aycock and I have shown that the distribution of such neutralizing substance in the normal population coincides faithfully with the age distribution of the disease and parallels closely similar figures for the Schick test, thus adding indirect, but strong evidence of its specificity.

The term "neutralizing substance" refers to the property of the serums of convalescent and immunized animals and convalescent human beings to render an actively infective virus innocuous. That the action of such serum on a virus is in the nature of a neutralizing action rather than a destructive one is suggested by the experiments of Olitsky, Rhodes, and Long who by means of cataphoresis were able to recover active poliomyelitis virus at the anode from a completely neutralized mixture of virus and serum. This action of immune serum on virus is the basis for the therapeutic and prophylactic uses of immune poliomyelitis serum.

What experimental evidence have we, however, that such neutralizing action takes place in vivo? In reviewing the literature on the therapeutic and prophylactic use of human convalescent serum, one is struck by the frequency with which the early experiments of Flexner and his coworkers are quoted. These workers were able to protect their animals against intracerebral and intranasal inoculation of the virus from one to four days following intrathecal administration of immune poliomyelitis serum. These results are unique in that they are essentially the only clear-cut evidence of protection. Most that can be said for practically all other analogous experiments is that the results may suggest such protection but are not clear-cut or convincing.

Certainly our own experience with human serum, both human and monkey, as a therapeutic or prophylactic agent has been anything but reassuring. The time here is too limited to give the details of all our experimental efforts, but I should like to mention the results of a few of our experimental attempts at the prophylactic and therapeutic use of human convalescent serum.

We have failed to protect our animals against intracerebral inoculation of virus for even twenty-four hours by the administration of potent immune serum subcutaneously, intramuscularly, or intravenously in huge doses. Furthermore, the infectivity of the cords of animals treated during the incubation period seemed unaffected even when such large quantities of immune serum as from 5 to 16 c.c. per pound or from 10 to 30 c.c. per kilogram of body weight were administered.

In other experiments we made an effort to determine the fate of the immune substance. Animals were given subcutaneous inoculations of immune serum, were bled 6, 12, 24, 48, 72, 96, and 120 hours after administration, and neutralization tests were done on these samples. In only a single instance were we able to detect the presence of the neutralizing substance in such serum, and this occurred in a specimen of blood coming from an animal twelve hours following the administration of 75 c.c. of immune homologous or monkey serum. In animals receiving less serum, such immune substance could not be detected, nor could it be detected in animals receiving the larger dose longer than twenty-four hours following the administration of the serum. We failed completely to detect any trace of human serum even twelve hours after its administration.

We have modified our technic so that only small infective doses of virus were employed in the neutralization tests, but the results were essentially the same as when larger infective doses were employed. These results coincide with our failures to protect such animals against intracerebral inoculation of virus following the administration of serum, as well as our failures to alter the outcome of the disease by the administration of large doses of serum following intracerebral or intranasal inoculation.

A possible explanation for our failure to detect the presence of neutralizing substance in the serum of these animals suggested itself: namely, that the substance was so greatly diluted by the body fluids as to render its detection difficult or impossible. This seemed reasonable in view of the low titer of neutralizing substance in convalescent serum. When we were fortunate enough to obtain from Dr. Schaeffer in Dr. Park's laboratory, a small amount of concentrated hyperimmune poliomyelitis horse serum with a titer some 40 times that of human convalescent serum, we

repeated some of our protection experiments employing this serum. In a small series of 6 animals inoculated subcutaneously with 10 c.c. of this serum per kilogram of body weight, we were apparently able in one instance to obtain protection against intracerebral inoculation of a small but constant infective dose of virus five, but not six, days following administration. Dr. Schaeffer, independently, obtained the same result, even though he employed a larger infective dose of virus. Unfortunately, we have not been able to secure more of this serum.

This single positive observation, among the many negative observations, has stood out in our minds as a hope and encouragement that some such specific prophylactic agent will be developed. But realizing the vagaries of poliomyelitis virus and knowing that monkeys, although uniformly susceptible, may vary in the degree of susceptibility, we have been very hesitant in accepting this isolated observation as decisive evidence.

In spite of the many negative results and only the uncertain suggestions that some protection may have been obtained, the general feeling and urge has been to employ such serum for human prophylaxis, and there have appeared in the literature the results of a number of such efforts to confer protection by the administration of parental blood or human convalescent serum in epidemic areas. An analysis of these results brings out several interesting and important points, which serve to emphasize the caution which must be exercised in evaluating such data.

At this point, it might be well to consider some epidemiologic and clinical features of the disease so that we may obtain some notion of the conditions under which information may be obtained. In the first place, poliomyelitis is a disease of low incidence, indicating that many thousands of children must be inoculated before the value of any prophylactic agent can be determined. In the second place, the outcome of infection is not predictable. We have no way of telling at the outset whether the child will escape or be badly crippled. All that can be said is that studies of the outcome of large series of recognizable and diagnosable cases indicate that a half or more of the cases escape paralysis. This emphasizes the importance of including an adequate number of uninoculated controls in such a study. In the third place, although poliomyelitis is endemic in certain locations, the epidemic occurrence of the disease is unpredictable for any given area or district; thus, we are seldom prepared to take advantage of a situation at the outset on an outbreak.

Furthermore, the duration of an epidemic of poliomyelitis is seldom longer than three months. We are usually well past the first third of the outbreak before we realize that we are dealing with anything more than a sporadic occurrence of the disease in an endemic area. Unless by happy chance an adequate organization is present in the field to initiate and carry on an experiment in prophylaxis, from two to four weeks more are lost before the mechanics of the preparation for the experiment are under way. Since a certain interval of time is further required for the actual administration of the material in question and by the time such inoculations have been accomplished and allowance is made for the incubation period of the disease, the greater part of the epidemic is over, and the resultant information can apply only to the smaller and waning portion of the outbreak.

I should like to illustrate how the above mentioned factors function by analyzing two recent efforts to test the prophylactic value of immune poliomyelitis serum.

In the summer of 1932 the town of Bradford, Pa., was visited by an outbreak of the disease. At the suggestion of Dr. Brebner of Dr. Park's laboratory, the local health authorities in Bradford established a free clinic at which 15 to 20 c.c. of parental blood was administered intramuscularly to children.

The first case of poliomyelitis was reported on August 25 and the last case October 17. Twelve hundred children were inoculated at the clinic and about 100

more by private physicians. About 2,500 children of the same age group did not receive serum and constituted the control group. One case occurred in the immunized group, while 32 cases occurred in the control group.

At first glance these figures seem impressive, but a consideration of the epidemic curve and the time elements shows fairly clearly that information can only be obtained concerning the portion of the outbreak between about the first and the seventeenth of October, which constituted the milder and waning portion of the outbreak. Information is not available concerning the number of cases reported up to the first week in October.

Although there may have been a strong clinical impression that the blood had been of value, yet from the above analysis it must be seen that too little information was actually available to justify any conclusion.

Another similar effort to determine the prophylactic value of immune serum for poliomyelitis was carried out in Philadelphia by Stokes and his coworkers that same year. The rapid and efficient organization of the unit and the happy cooperation of the many local health and other agencies is a commendable example of a community health venture.

The first case of the disease was reported in July, but it was not until the middle of August that Philadelphia realized that it was in the midst of an outbreak of the disease, second only to the severe outbreak of 1916. The peak of the outbreak was reached the fourth week in August. The unit at the Children's Hospital in Philadelphia began to function on August 20 and thereafter for six weeks, or until the epidemic was over. During this time 1,341 children were injected with 60 c.c. each of parental whole blood. Other hospitals in Philadelphia cooperated in the effort, although human convalescent serum in smaller amounts was employed by some of these institutions in place of parental blood. The total number of children including those inoculated by other institutions was 2,179.

The incidence of the disease in the inoculated group was 1 to 363. The incidence for the same age group in the rest of the city was 1 to 555. From this analysis it must be fairly obvious that even less information is available from this study than from the Bradford effort. Since immunization of children began on August 20 and continued until the outbreak was over, there was a constant selection of children who probably would not have contracted the disease in any case, and at the same time they were excluding those children who contracted the disease during this portion of the outbreak.

Effective clinical trial of the prophylactic value of an agent depends on the presence of a well-organized unit at the outset of an outbreak. With such a unit constantly on the alert for the early appearance of cases in unusual numbers, information concerning a significant portion of the outbreak might be obtained. However, in view of the unpredictableness of epidemics of poliomyelitis, much time will unquestionably pass before sufficient data will have been accumulated.

Recently, Armstrong and Harrison, Sabin, Olitsky and Cox, and Schultz and Gebhardt have suggested that effective blocking of the virus at the nasal mucous membrane in the experimental animal may be accomplished by a variety of chemical substances. Should such chemicals prove effective, it must also be established that the prolonged use of such substances will have no injurious effect on the nasal mucous membranes.

Furthermore, since the protection afforded would be a transient one, susceptibles would remain susceptible to future exposures later in life. Since immunization and protection to the disease is the result of exposure to the virus, withholding such exposure and immunity to a later period in life would be similar in effect to converting an urban population to the status of a rural community, where exposures and disease

come later in life. Therefore, it appears to us that, since exposure to infection is a direct function of concentration of population or of irreducible human contact, a more logical approach to the control of the disease is through active immunization.

## DISCUSSION

CHAIRMAN TOOMEY.—It is your opinion then that the use of poliomyelitis convalescent serum is questionable. What would you do if your own child were exposed to poliomyelitis?

DR. KRAMER.—It is very uncertain as to what I would do.

CHAIRMAN TOOMEY.—I question the evidence which tends to show that there are multiple strains of poliomyelitis virus, but this is a minor point and not germane to our discussion. I agree with Dr. Kramer about the use of nasal sprays, not because their use may do harm to the nasal mucosa, but because there is no conclusive evidence that the disease enters the human being by way of the nasal pathway. If the virus of the disease enters the human being by way of the gastrointestinal tract, as I believe it does, then such procedures would be valueless.

DR. HOYNE.—I favor the use of convalescent serum in poliomyelitis on the ground that it does no harm and it may do some good. Some say it must be used in preparalytic stage. Some say 87 per cent will never develop paralysis in any group of cases. The temperatures will not only go down in convalescent serum treated cases but also in the control cases—the hospital case. Perhaps the response is nonspecific and due to care alone. This subject brings out the difficulty of evaluating any serum. I believe the patients should get more serum, though never intraspinally. If it is given intravenously, the children do a lot better since most physicians see the case at height of paralysis, and it does not spread further. It is hard to draw definite conclusions.

DR. MARTMER.—I believe that convalescent poliomyelitis serum has no value; or, if it has any, it must be given intravenously and in large doses and in the early case. The public has been erroneously educated as to its value as a prophylactic. If the exposed child receives his convalescent serum the parent ceases to worry, and the child is exposed further because of the false sense of security. One should never use the material intraspinally since it may set up sterile meningitis.

DR. R. H. McBRIDE (Sioux City, Iowa).—One should ever be cautious about the effect on the public. One should not by selling something of questionable value lessen confidence of the public in these things that are of proved value.

DR. KRAMER.—I had the clinical impression that convalescent serum is of value, until we studied our control groups. Convalescent serum will perhaps do no harm, but it is possibly of no value; use it if you want to do so. Remember that no control group has proved its value, and in prophylaxis it certainly is of no use. Tannic acid in the nose will do a great deal of damage and harm, especially when it can be secured by the public. This holds true for all the other chemicals bought over the drug counter by the public.

Dr. Maxwell P. Borovsky, Chicago.
Dr. Matthew Winters, Indianapolis, Ind.
Recorders.

# MEETING OF THE EXECUTIVE BOARD OF THE AMERICAN ACADEMY OF PEDIATRICS

The Meeting of the Executive Board was called to order at 11 A.M., Nov. 28, 1936, at the Georgian Hotel, Evanston, Ill. Those present were Dr. L. R. DeBuys, president; Dr. Philip Van Ingen, vice president; Dr. Clifford G. Grulee, secretary; Dr. Louis C. Schroeder; Dr. Edward C. Mitchell; Dr. Henry F. Helmholz; and Dr. Edward B. Shaw.

The following applicants were elected to membership:

REGION I

Dr. Samuel Ash, Newark, N. J.
Dr. Joseph S. Baird, Pittsburgh, Pa.
Dr. Mary Knott Bazemore, Merion, Pa.
Dr. Israel Binder, Philadelphia, Pa.
Dr. Randolph K. Byers, Boston, Mass.
Dr. Albert Graham Davis, Utica, N. Y.
Dr. Sarah S. Deitrick, Washington, D. C.
Dr. James M. Dobbins, Long Island City, N. Y.
Dr. Katharine G. Dodge, New York, N. Y.
Dr. Lawrence C. V. du Buse, Elizabeth, N. J.
Dr. R. Cannon Eley, Boston, Mass.
Dr. Bernard Fein, Newark, N. J.
Dr. Elias Freidus, Long Beach, N. Y.
Dr. Charles R. Goldsborough, Baltimore, Md.
Dr. Francis J. Gustina, Buffalo, N. Y.
Dr. Jonathan P. Hadfield, Fall River, Mass.
Dr. Rachel L. Hardwick, Boston, Mass.
Dr. George Heller, Englewood, N. J.
Dr. Arthur Heyman, Newark, N. J.
Dr. Alice K. Higgins, Rockville Center, N. Y.
Dr. Harold L. Higgins, Boston, Mass.
Dr. Frederick H. von Hofe, East Orange, N. J.
Dr. John Williams Holmes, Philadelphia, Pa.
Dr. Frederic S. Huntington, Scranton, Pa.
Dr. A. Elizabeth Ingraham, Hartford, Conn.
Dr. Earl Francis Kelly, Pawtucket, R. I.
Dr. Dorothy M. Lang, White Plains, N. Y.
Dr. Abraham M. Litvak, Brooklyn, N. Y.
Dr. George C. Ludlow, New London, Conn.
Dr. Harry Berst Mark, Riverton, N. J.
Dr. Paul J. McGuire, Homestead, Pa.
Dr. Stephen Dow Mills, Westfield, N. J.
Dr. Gordon Manace, Toronto, Ont., Canada.
Dr. Marion S. Morse, Endicott, N. Y.
Dr. Alfred A. Nathans, Brooklyn, N. Y.
Dr. Rae V. Nicholas, Philadelphia, Pa.
Dr. William J. Orr, Buffalo, N. Y.
Dr. Warren Ripley, Montclair, N. J.
Dr. Harvey O. Rohrbach, Bethlehem, Pa.
Dr. Frank E. Roth, Hartford, Conn.
Dr. Isadore B. Rothstein, Newark, N. J.
Dr. Harry Benj. Silver, Newark, N. J.
Dr. Charles I. Solomon, Meriden, Conn.
Dr. Susan Page Souther, Hartford, Conn.
Dr. Harry A. Spigel, Washington, D. C.
Dr. Lucy Porter Sutton, New York, N. Y.
Dr. Abraham Tow, New York, N. Y.
Dr. Jacob Wallace, Boston, Mass.
Dr. Stanley M. Wershof, New York, N. Y.
Dr. Luvia Willard, Jamaica, N. Y.
Dr. Israel J. Wolf, Paterson, N. J.

REGION II

Dr. M. Vaun Adams, Mobile, Ala.
Dr. John Edmund Ashby, Dallas, Texas.
Dr. John Mason Bishop, Roanoke, Va.
Dr. James W. Britton, Anniston, Ala.
Dr. Nicholas B. Cannady, Dothan, Ala.
Dr. Philip C. Elliott, Nashville, Tenn.
Dr. Robert M. Finks, San Angelo, Texas.
Dr. Maurice Fliess, Clifton Forge, Va.
Dr. Thomas Archer Gibson, Winchester, Va.
Dr. A. C. Gipson, Gadsden, Ala.
Dr. R. C. Goolsby, Jr., Macon, Ga.
Dr. David W. Goltman, Memphis, Tenn.
Dr. J. S. Hunt, Charlotte, N. C.

Dr. W. Eugene Keiter, Kinston, N. C.
Dr. Charles L. Kennon, Miami, Fla.
Dr. Thomas E. Oast, Portsmouth, Va.
Dr. Jack Furman Perkins, Dallas, Texas.
Dr. Sam Phillips, Little Rock, Ark.
Dr. William Ewing Sinclair, Orlando, Fla.
Dr. Henry S. Stern, Richmond, Va.
Dr. T. D. Walker, Jr., Newport News, Va.
Dr. Charles Wallis, Little Rock, Ark.

REGION III

Dr. Katherine Bain, St. Louis, Mo.
Dr. Emanuel B. Brandes, Cincinnati, Ohio.
Dr. John C. Sandford Brown, Saskatoon, Sask., Canada.
Dr. Isador M. Epstein, Chicago, Ill.
Dr. A. J. Fletcher, Danville, Ill.
Dr. I. H. Kass, Toledo, Ohio.
Dr. Bertrand I. Krehbiel, Topeka, Kan.
Dr. Ralph H. Kunstadter, Chicago, Ill.
Dr. Benjamin M. Levin, Chicago, Ill.
Dr. Waldo E. Nelson, Cincinnati, Ohio.
Dr. A. W. Pinkerton, Lima, Ohio.
Dr. Benjamin Rappaport, Evanston, Ill.
Dr. C. R. Rittershofer, Cincinnati, Ohio.
Dr. Geneva Shong Rothemund, Columbus, Ohio.
Dr. Alwin C. Rambar, Chicago, Ill.
Dr. Irwin Rubell, Chicago, Ill.
Dr. Arthur S. Sandler, Chicago, Ill.
Dr. Martha Souter, Indianapolis, Ind.
Dr. Hart Edgar Van Riper, Madison, Wis.
Dr. Simon A. Wile, Chicago, Ill.

REGION IV

Dr. Harry R. Carson, Phoenix, Ariz.
Dr. Einor H. Christopherson, San Diego, Calif.
Dr. Thomas W. Cornwall, San Francisco, Calif.
Dr. Darcy M. Dayton, Tacoma, Wash.
Dr. William C. Deamer, San Francisco, Calif.
Dr. Frederick R. Fischer, Spokane, Wash.
Dr. A. Lawrence Gleason, Oakland, Calif.
Dr. Paul H. Herron, Spokane, Wash.
Dr. Robert S. Leet, Oakland, Calif.
Dr. Donald C. Marshall, San Francisco, Calif.
Dr. Emmett E. Sappington, San Francisco, Calif.
Dr. Frank M. Sprague, Boise, Ida.
Dr. G. D. Carlyle Thompson, Boise, Ida.
Dr. Arthur E. Varden, San Bernardino, Calif.
Dr. Lynn B. Vaughan, Long Beach, Calif.

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The next Annual Meeting will be held at the Waldorf-Astoria Hotel, New York City, June 3, 4, and 5, 1937. The following program was decided on:

June 3, Morning—Round tables
Afternoon—Exhibit demonstrations
June 4, Morning—Business meeting
President's address
Two outstanding papers
Afternoon—Panel discussions
June 5, Morning—Repetition of round tables

The following subjects were tentatively chosen for the round table discussions:

Adolescence
Anemia of the newborn
Asthma
Childhood psychiatry
Common skin diseases
Diabetes
Eczema
Eye diseases—squint
Gonococcus infection
Meningococcic meningitis
Nephritis
Poliomyelitis
Sedimentation rate
Treatment of empyema
Vitamins.

Regarding the round tables, it was decided that a secretary from each group registered for each round table be chosen and the same plan be carried out as last year.

The following subjects were tentatively chosen for exhibit demonstrations: "Intravenous Therapy," "Unusual Diseases of the Bone," and "Urinary Infections."

The exhibit demonstrations are to cover a period of three-quarters of an hour each: half hour for the demonstration and fifteen minutes for questions from the floor. A man may be interrupted at any time during the demonstration with questions from the audience.

The following subjects were tentatively chosen for panel discussions: "Present Status of Active Immunization Against Scarlet Fever" and "Present Status of Active Immunization Against Whooping Cough." The panel discussions are to be for a period of one and one-half hours each with fifteen minutes' intermission.

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The financial report and the budget were approved. It was moved, seconded, and carried that $5,000 be taken from the checking account and placed in a savings account in another bank.

Dr. Grulee reported that the Committee on School Health and School Health Education is preparing an extensive investigation.

Report of the Committee on Clinical Investigation and Scientific Research regarding the offer of the Borden Company to give to the American Academy of Pediatrics directions for the use of the rights of the patent of the Borden Company for freezing breast milk, was read and was approved. The report follows:

**Report of the Committee on Clinical Investigation and Scientific Research on the Offer of the Borden Company to Give to the American Academy of Pediatrics Directions for the Use of the Rights of the Patent of the Borden Company for Freezing Breast Milk**

On Jan. 27, 1936, Dr. James A. Tobey, Director of the Department of Health Service of the Borden Company, wrote to the American Academy of Pediatrics that the Borden Company proposes to make this process available without charge to ethical hospitals having proper facilities for its use. In order to license such accredited hospitals, it is proposed that a medical board be set up consisting of Dr. Paul W. Emerson, two members appointed by the American Academy of Pediatrics, and one member appointed by the Council on Medical Education and Hospitals of the American Medical Association, the secretary of the committee to be Mr. Raymond Hertwig, now associated with the Borden Company, who would carry on all active work in accordance with the policies set by this medical board. The board would not represent this company but would merely be an impartial group of distinguished medical scientists concerned with a process that seems to offer a real contribution to certain aspects of the science of pediatrics.

This request was referred to the Committee on Clinical Investigation and Scientific Research with power to act.

A conference was held with Dr. Tobey and after the conference he wrote a letter, May 29, 1936, saying that in order to do this, it would be desirable to have an impartial medical committee which would license prospective users of the process. Such a committee would not represent the Borden Company but would be selected and appointed by some such logical agency as the American Academy of Pediatrics. The Borden Company will assign to the committee a competent secretary to carry out these policies and to undertake all necessary administrative activities. He said that the Borden Company had in mind for this duty Mr. Raymond Hertwig.

In a later conference Dr. Tobey stated that if the Academy did not wish to have the services of Mr. Hertwig and cared to administer the use of this patent through its own office there would be no objection. He explained that this process was legally patented by the Borden Company and that the Borden Company desires no revenue from it and is willing to turn over all rights in process to any authoritative medical body which could then investigate and license qualified and reputable hospitals or groups of medical men, or welfare agency under medical supervision or guidance. Licenses have already been given to

a. Mother's Milk Bureau under the Children's Welfare Federation of New York City, Dr. Carl Laws of Brooklyn, Chairman of the Medical Advisory Committee.
b. The Memorial Hospital of Houston, Texas, Mr. Robert Jolly, Superintendent.
c. The method is being used by the Directory for Mother's Milk in Boston, under whose auspices and through whose initiative the process was developed, although the Borden Company states that they bore all the expense of this development. No license has, as yet, been signed for its use by this Directory because of certain disagreements between the Directory and the Borden Company.

Applications for its use have been made by the California Babies' Hospital of Los Angeles, which has requested the sole license for the state of California. Inquiries have been made by Dr. Weigand, of Omaha, Neb.; the Harlem Hospital of New York; a hospital in Cleveland; Dr. Moore, of Dallas, Texas; and others.

We understand that the organizations which are now using the process for freezing breast milk, with or without licenses, are as follows:

Directory for Mother's Milk, Inc.
221 Longwood Avenue
Boston, Mass.

Dr. S. Graham Ross
Royal Victoria Maternity
Montreal, Canada

Dr. Fraser
Fraser Hospital
Royal Victoria Maternity
Montreal, Canada

Dr. Alfred J. Scott
Dr. Robert Ramsey
California Babies' Hospital
Los Angeles, California

Mr. A. R. M. MacLean, Technical Director
Eastern Dairies, Limited
7460 Upper Lachine Road
Montreal, Canada

The Registry for Mother's Milk
Forbes & Halket Streets
Pittsburgh, Pa.

This offer of the Borden Company brings up again a specific example of the problem of commercial patents as applied to health and welfare. In the opinion of your committee there is not yet enough data available to make it clear what bearing this offer of the Borden Company has on the general problem.

The offer of the Borden Company seems to be a very gracious action with a highly ethical purpose, and during our conversation with Dr. Tobey that seemed to

be the purpose back of the offer. The committee believes that if such an offer were accepted, the administration of this patent should be solely in the hands of the Academy of Pediatrics and entirely separated from the Borden Company. It does not believe that this patent could be satisfactorily administered and the public protected if it were handled in the manner first suggested.

If the Academy undertook to handle such a patent it would necessitate

a. A committee which would be able to visit and investigate all the applications for the use of the patent. In one instance the Borden Company has thrown down a request, after investigation.
b. It would necessitate overseeing the use of the patent to see that the methods of freezing milk were done properly and the directions carried out. This would require periodic inspections.
c. It would probably require taking to court any infringement of the patent and protecting it.

In our opinion, the supervision of this work would necessitate considerable administrative expense. Your committee, therefore, reports that in its opinion the present organization of the Academy of Pediatrics is not such that it can undertake the responsibilities and the expense involved in accepting the administration of this patent.

Respectfully submitted,
(Signed) *Fritz B. Talbot*, Chairman.
*Henry F. Helmholz.*

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The requests of Dr. Maynard Ladd, of Boston, and Dr. Ann Martin, of Hayward, Calif., to be placed on the Emeritus list were granted.

Dr. Carroll E. Palmer, of Washington, D. C., was elected to Associate Fellowship at the request of Dr. L. Emmett Holt, Jr.

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A letter was read from Dr. Charles Bradley, of East Providence, R. I., requesting approval of the Academy of the Emma Pendleton Bradley Home. It was decided that the Executive Board was in no position to do this and that his request should be referred to the Committee on Medical Education.

The letter from Dr. Frederick B. Miner, of Flint, Mich., regarding the Academy's interpretation of the word "crippled" was then taken up. It was decided that a much broader interpretation should be put on the definition of this word than is usually done by orthopedic surgeons.

The letter of Dr. Julian P. Price, of Florence, S. C., regarding a publication for the education of general practitioners, was discussed. It was decided that the Academy could not undertake such a publication at the present time, since the Executive Board did not feel that it was feasible.

The request of Mr. Max Freeman, of Los Angeles, Calif., that the Academy approve his institute, was not granted, since the Executive Board felt that the Academy was in no position to do this.

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The question of associate chairmen of regions and the method of their selection was discussed. It was decided to leave with Dr. Helmholz the formulation of these ideas and submit them to the membership at the next annual meeting after approval by the Executive Board.

# MEETING OF REGION IV OF THE AMERICAN ACADEMY OF PEDIATRICS

The fifth annual meeting of Region IV of the American Academy of Pediatrics was held in San Francisco on October 22-24, 1936. While exact attendance figures are not available, owing to incomplete registration, it is believed that not less than 90 per cent of the membership of the region was in attendance, including representatives from all the states and the Territory of Hawaii. In addition, many nonmembers were present, and the average attendance at the various sessions was about one hundred. Abstracts of papers on the program follow immediately. Dr. Karl F. Meyer, professor of bacteriology of the University of California and head of the Hooper Institute for Medical Research, gave, by invitation, an exhaustive and valuable review of the diseases caused by the neurotropic viruses. The round table discussion of prophylaxis of communicable diseases attracted general interest. The annual dinner, held at the Concordia Club and arranged by Dr. Cohn and Dr. Dearing, was well attended and successful. Dr. Joseph B. Bilderback was toastmaster, and brief addresses were given by Dr. Clifford G. Grulee, secretary and treasurer of the Academy, Dr. Henry Dietrich, and others. It was tentatively decided to hold the 1937 meeting at Del Monte, Calif.

**Fetal Respiratory Movements. Barnet E. Bonar, M.D.**

This is a discussion of a method to evaluate the effects upon the fetus of obstetric analgesics and anesthetics.

The status of present-day obstetric analgesia and anesthesia was discussed critically, and the lack of decided progress in this field was pointed out. The methods that have been used to evaluate the effects of obstetric analgesia and anesthesia were outlined. It was stated that the criteria used to determine the effects of these preparations upon mother and child, with few exceptions, were so grossly inadequate that accurate deductions were impossible. The clinical method has so far given little information of value. From the maternal standpoint hysterographic methods should be used if authentic data are to be had. In respect to the fetus the method described by Rosenfeld and Snyder of visualizing the fetal respiratory movements deserves more attention. It consists of exposing the uterus of the experimental animal after transection of the spinal cord and observing with the naked eye the effects of the various drugs upon these movements. Motion pictures may be taken. This method was described and color motion pictures shown illustrating the respiratory movements through the exposed but intact uterus in the rabbit and dog. In order to study more closely the types of respiratory movements, pictures were taken of the fetuses lying in the transparent amniotic sac. Two types of respiratory movements were observed, and the inhibiting effects of ether and some of the basal analgesics upon these movements were noted. The possibilities of studies of this nature were pointed out, and it was suggested that the scientific accuracy of this method could be enhanced if an apparatus for registering these movements effectively over a longer period of time could be devised. Efforts are being extended along these lines at present so that more information can be obtained regarding the effects upon the fetus of analgesics, anesthetics, and oxytoxics used in childbirth, as well as investigations made upon the effect of carbon dioxide concentrations upon the fetus in utero.

**Roentgen Ray Treatment of Acute Cervical Adenitis. Samuel Hurwitz, M.D., and Sidney N. Zuckerman, M.D.**

Sixty-two children with acute cervical adenitis were treated with small doses of roentgen rays (about 80 r.). Resolution occurred in 52 (83.9 per cent) cases, while 9 (14.5 per cent) cases terminated in suppuration. In a group of 21 adequately con-

trolled, hospitalized patients, who were irradiated, 17 patients (81 per cent) were cured as opposed to 10 patients (58.8 per cent) treated by other measures. Suppuration resulted in 3 children (14.3 per cent) treated with roentgen rays as opposed to 7 (41.2 per cent) in the control group. Rapid subjective improvement and accelerated termination is a striking feature of roentgen therapy. Radiation is most beneficial in the early stage of inflammation in which absorption is the usual final result. If suppuration is already present before treatment is started, necrosis is hastened and early centralization of the infection results.

**Exanthem Subitum. Lloyd B. Dickey, M.D.**

Exanthem subitum is a clinical entity, of as yet unknown etiology, but having no known relationship to other common exanthems. Most cases occur during the first two years of life, and in San Francisco it is probably the commonest exanthem under one year of age. The most constant feature of the symptomatology is a three- or four-day prodromal period of fever which disappears by crisis, the macular rash always occurring after the crisis. Numerous other symptoms may be present, and convulsions at the onset are not uncommon. The blood count at some time during the course shows a leucopenia, with relative increase in the lymphocytes. The patient should be observed at least forty-eight hours after a fall of the temperature suggesting this disease, for the rash which makes the diagnosis. The rash before its appearance to the unaided eye, may sometimes be seen under the ultraviolet light as long as twenty-four hours before the crisis.

**Epidemic of Unknown Etiology. Myrl Morris, M.D.**

An epidemic occurring in a foundling home in babies under three months of age is reported. The author suggests from the symptoms found in the infants that the invader might be a filtrable virus with an affinity for the autonomic nervous system.

A résumé of the pathologic findings in six autopsies is included in the report.

**Vitamin C in Rheumatic Fever. James F. Rinehart, M.D.**

The experimental basis for the concept that rheumatic fever may be due to the combined influence of vitamin C deficiency and infection was briefly reviewed. Following this, studies on the metabolism of vitamin C were reported. It was shown in confirmation of the studies of Farmer and Abt that the concentration of vitamin C in the blood plasma is an accurate index of the immediate nutritive state relative to vitamin C. The "normal" fasting plasma vitamin C level in children we consider to range from 0.7 to 1.5 mg. per 100 c.c. Levels below 0.5 mg. are considered low. Analyses were reported in rheumatic fever and control groups. A series of 21 cases of acute rheumatic fever gave values which ranged from 0.13 to 0.68 mg. with an average of 0.39 mg. per 10 c.c.; 76 per cent were in the range considered to be low, i.e., below 0.5 mg. In a control series of children admitted to the University of California Hospital for tonsillectomy, values ranged from 0.19 to 1.57 mg., the average being 0.83 mg.; 74 per cent gave values above 0.5 mg. Almost identical values were found in a series of 19 cases of miscellaneous nonrheumatic infections. Without reference to the mechanisms creating the depletion, these data are considered to be in accord with the concept that vitamin C deficiency may be a factor in the etiology of rheumatic fever.

**Fulminant Streptococcic Sepsis in Infancy. John Mott Rector, M.D.**

A syndrome of acute streptococcic sepsis in infancy is described in which death follows the onset of a bacteremia with such rapidity that localizing signs rarely have time to appear. Of interest etiologically was the finding of active rickets

among most of the patients. Although there are various portals of entry for this type of infection, the most common entrance is through the pharynx and communicating cavities.

There is a fairly well-defined uniformity in the pathologic changes observed, the most typical feature being early interstitial bronchopneumonia. Common symptoms include hyperpyrexia, vomiting, diarrhea, meningismus, and severe convulsions. While positive blood cultures offer the best confirmatory evidence, it is possible to make the diagnosis clinically if the condition is kept in mind.

**The Practice of Pediatrics in Hawaii. Joseph Palma, M.D.**

Some of the interesting features of the practice of pediatrics on "the loveliest fleet of islands anchored in any ocean" are presented. The similarity with mainland procedures was noted in infant feeding and supervision, and the moderate course of contagious and infectious diseases was discussed. Attention was directed to the absence in Hawaii of any of the group of tropical diseases and malaria. A symptom-complex known as *febricula hawaiiensis* was identified as epidemic vomiting disease, recently described by Greenthal. The first clinical findings of leprosy observed in children were discussed in some detail, with emphasis on the neurologic rather than on the dermatologic character of the early lesions. Pertinent comment upon certain trends in modern pediatric practice was presented in conclusion.

**Some Pathologies of Light. Lloyd E. Hardgrave, M.D.**

A case of hydroa aestivale vacciniforme with porphyrinuria with a demonstration of the spectral region of sensitivity was presented, the patient being photosensitive and manifesting skin lesions when exposed to sunlight. The patient reacted with a marked erythema to wave lengths between 3,200 Å and 4,500 Å, indicating a hypersensitivity to this radiation, which is that most strongly absorbed by the porphyrins. It has been, however, impossible thus far to reproduce the hydroa lesions experimentally with these or any other wave lengths. The patient was treated biweekly with quartz-mercury arc radiation, which contains relatively little of these wave lengths, for many months, which produced no abnormal reaction but produced a healthy normal coat of tan, and rendered the patient less vulnerable when exposed to natural sunlight.

Other evidences of photosensitivity in man were described, particularly those following the oral administration of dye substances; and in animals, of some foods and plants such as buckwheat and St. John's wort.

More pertinent data following this study has been the observation that although the radiations which produce erythema, tanning, and vitamin D formation are in the same zone, i.e., shorter than 3,200 Å, they are not identical, and it is quite probable that many patients that have been given tanning by quartz-mercury arc lamps have not had a simultaneous stimulation of their vitamin synthesis and that such lamps would bear more careful analysis of their radiation wave lengths, thus more accurately establishing their therapeutic value.

An appeal was made to all pediatricians to analyze carefully the various sources from which their patients received vitamin D before prescribing wholesale treatments with the mercury arc lamps or sun baths lest certain individuals be found to be receiving a definite pathologic overdosage of this particular vitamin.

**"Stippled" Formation of Epiphyses in Hypothyroidism.**
**By William A. Reilly, M.D., and Francis Scott Smyth, M.D.**

Some of the more severe cases of hypothyroidism show a peculiar stippling in the formation of the epiphyses, principally in the long bones, occasionally in the vertebrae. These are usually bilateral and occur in several different areas, in the following order of frequency—the heads of the femurs, humeri, and the lower end of

the radii. The lesion is not destructive, responds readily to thyroid therapy and usually results in normal epiphyses if treatment is started early in the formation. This is not a Legg-Perthes' disease.

**Phlyctenulosis. Harold K. Faber, M.D., and Lloyd B. Dickey**

This local affection of the eye occurs almost exclusively in individuals with past or present tuberculous infection, as shown by the presence of positive reactions to tuberculin. Furthermore, the reactivity is much greater than the average as judged by the greater average size of the reaction. Clinically, signs and symptoms of active tuberculosis are usually, but not always, absent. Therefore, it seems unlikely that the ocular disorder is produced by endogenous tuberculin or tuberculous products acting on a sensitized conjunctiva, but much more probably by tuberculous material (droplets, dust, etc.) gaining access to the eye from without in tuberculin-hypersensitive individuals. While animal experiment is inconclusive, experience with the Calmette test has shown conclusively that tuberculin dropped in the eye in sensitive individuals will frequently produce phlyctenulosis and provides experimental confirmation of the theory propounded.

If these conclusions are correct, phlyctenulosis is a direct indication of contact with tuberculosis and has an important public health aspect, since it makes a search for the source of contact imperative.

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## MEETING OF THE STATE CHAIRMEN OF THE AMERICAN ACADEMY OF PEDIATRICS

The meeting of state chairmen of the American Academy of Pediatrics was called to order at 8 P.M. in the Hotel President, Kansas City, Mo., by the president, Dr. Henry Dietrich, May 11, 1936.

PRESIDENT DIETRICH.—The meeting of state chairmen will please be in order. I shall ask Dr. Eliot to preside and conduct the discussion.

Dr. Martha Eliot assumed the chair.

DR. ELIOT.—The Committee on Child Health Relations has a brief report to make, which I shall read to you at this time. (Dr. Eliot read the report.)

I would like to add one or two facts with respect to the Social Security Act, which have not been included in this brief report. In the first place, in regard to the program for crippled children, thirty-nine states have submitted plans to the Children's Bureau. Under the program for child welfare services, which has to do with "dependent, neglected, and homeless children, and children in danger of becoming delinquent," plans have been submitted by the state departments of public welfare of twenty-nine states, and of these, twenty-five or twenty-six have been approved. The program for crippled children is new in many of the states, as is also the child welfare program.

The maternal and child health plans began to come to the Children's Bureau before January 1, 1936. As soon as the Social Security Act became law in August, 1935, a few states began to develop their programs, but until it was known that money was to be available, the real stimulus for developing these plans was not very great. The majority of the plans were submitted in January and February just before the passage of the appropriation act which provided the money for the grants.

SECRETARY GRULEE.—What is the interpretation of the Bureau of the term "crippled children"?

DR. ELIOT.—I am glad that question was asked. In the federal act the words are "crippled children or children suffering from diseases that may lead to crippling." A definition was not given in the act, purposely, I believe, to allow for a broad interpretation based upon individual state laws. It is the intention of the Children's Bureau to interpret the term broadly, recognizing that a child may be crippled not only by poliomyelitis and other orthopedic conditions but also by disease of his cardiac muscle. Many of the states already have definitions in their state laws, but these definitions vary to such an extent that it is felt to be a mistake to attempt at this time to lay down a single definition.

SECRETARY GRULEE.—The Executive Board at its meeting yesterday passed a resolution stating that it regarded the word "crippled" in that sense as meaning physically handicapped (any physical handicap).

DR. ELIOT.—Of course, if you interpret the term "crippled" so broadly as to include any physical handicap, a child with one carious tooth might be included. I am exaggerating now, but that illustrates some of the questions that may come before us. For instance, shall we include as crippled children those who need tonsillectomies?

SECRETARY GRULEE.—That depends upon the interpretation of the term "handicap."

DR. ELIOT.—What are the conditions that handicap a child?

DR. DIETRICH.—We had in mind the cardiac condition and conditions of that sort. Ordinarily a crippled child means a crippled child from an orthopedic standpoint.

DR. ELIOT.—I talked only today to an orthopedic surgeon and a pediatrician from the same state, both of whom are interested in working out plans under the crippled children's section. I told them they should get together with the state agency and work out a plan that would come under their state law and the provisions of the federal act.

DR. PAUL C. CARSON (KANSAS).—In connection with the crippled child program in Kansas, the matter of tonsils was terribly abused the first two or three years, and the funds available were used for cases like tonsillectomies.

DR. ELIOT.—The total amount of the grant in aid to crippled children is $2,800,000. All of it must be matched by the state. The total, you see, is not a very large sum of money, and most of the states appreciate that it should be conserved for children in the greatest need.

DR. MAURICE L. BLATT (ILLINOIS).—May I ask whether the interpretation regarding cardiac disease is to be broadly applied? It seems to me the large problem in Illinois is care of children with cardiac conditions, far larger than the orthopedic problem. We have adequate beds for orthopedic cases. We have anything but an adequate number of beds for cardiac cases. Do you feel we might utilize funds for care of cardiac patients?

DR. ELIOT.—I see no reason why the people who live in any given state and think one type of crippling condition is more urgent than another should not go to the state agency and urge whatever they think is the right procedure in that particular line. The question of inclusion of children with cardiac disease will vary from state to state and depend to some extent at least on the prevalence of the disease. When a state agency has asked what cardiac conditions may be included as "crippling," the reply has usually been that acute and early cases of the noncustodial type would seem to be the type that should be included. If the

child needs custodial care, treatment under this part of the act does not seem to be justified. The real purpose of the act is to save children from severe crippling.

DR. BLATT.—The situation we have to meet is that this cannot go on unless some amount of custodial care is provided. In Chicago it is limited because of the transportation of children with cardiac disease to a central school. In the rural community, even this inadequate service is lacking, and many children are handicapped by lack of education because of lack of custodial care.

DR. ELIOT.—You mean without boarding care. Let me say that the money under the crippled children's program is not for education. That ought to be clearly understood. Let us suppose a child who has recovered from poliomyelitis must be kept away from his home and near a center where he can receive physical therapy. Such a child can be given boarding home care which may be paid for from the grants under the act.

DR. LEE FORREST HILL (IOWA).—I take it that it is your wish and the wish of the Committee on Child Health Relations that the state chairmen in the various states take a fairly active part in the administration of this Social Security Act. There are many states, particularly the state in which I live, where the administration of the act is under the direction of the state department of health.

I wonder what provision is to be made for us to appoint members to cooperate with health departments without their willing acceptance of such committee appointments. Is the Academy or are you going to advise the state health departments in the various states who have already formulated a program and are already working that such appointments are going to be made?

There is also another phase in which I am interested in connection with the crippled children program in Iowa. I understand the ruling has been made in that state that crippled children are under the department of the Board of Education and not under the department of the Board of Health and that this work will be done at the state university, as a function of the Board of Education and not of the Department of Health.

DR. ELIOT.—The state health department has been designated by Congress as the official agency to administer the maternal and child health program. Similarly the part of the program that has to do with general public health is administered by the state department of health.

SECRETARY GRULEE.—Was it not to be in consultation with the medical, nursing and other groups?

DR. ELIOT.—The act itself outlines seven requirements that must be fulfilled before a state plan can be approved by the Children's Bureau. The sixth of these conditions is that the plan must show cooperation between the health department and medical, nursing and welfare groups and organizations. Our field consultants have discussed with the state agencies the intent of this requirement and have pointed out the importance of cooperation with state medical societies, the Academy of Pediatrics, the state committees on maternal welfare, etc. The state health department, however, when it submits to the Children's Bureau its plan, must show how this cooperation with medical groups and organizations is to be accomplished.

In a majority of cases, the state health department has appointed an advisory committee and in a good many instances the state chairman of the Academy has been appointed on this committee. In all cases a list of organizations represented on the committee is given in the plan and in many instances the names of the individuals on the advisory committees.

In the committee meeting yesterday we discussed at length how the state chairman might make contacts with the state health department. It was the consensus

in the committee that if the Children's Bureau would prepare a statement with respect to the Social Security Act, the committee would add to it suggestions for state chairmen. The committee felt that in this way the state chairmen might be given assistance as to how to approach the state health departments.

I hope, however, that the state chairman will in most cases go directly to the state health department or to the director of maternal and child health and ask about the plan.

Early in June the Children's Bureau is planning to hold a conference of the state directors of maternal and child health in Washington. We have already invited Dr. Grulee to attend this meeting to tell these state directors about the Academy and also Dr. Adair to discuss the work of the American Committee on Maternal Welfare.

DR. HILL.—I think a little note from you to the state health department would help a good deal.

DR. ELIOT.—When our field representatives can visit the states again that will be most helpful, as it has already proved to be.

DR. R. L. DEBUYS (NEW ORLEANS, LA.).—May I ask Dr. Eliot what her interpretation is of the term "crippled child" in the federal statute? Does she interpret it as meaning the lame and the deformed which are orthopedic cases, or does she include the physically handicapped child who might be crippled from some other condition, and disabled, as for example, a cardiac case? I do not think the point she made about a child with a carious tooth being included as a crippled child is fair. It might be that he is potentially crippled, but he would not, in my opinion, because of the carious tooth, come under the term of a "crippled child."

DR. HILL.—In connection with the crippled child title, it has been ruled it is under the Board of Education.

DR. ELIOT.—I will answer Dr. Hill's question first with regard to the state agency that will administer the crippled children's program. The federal act simply states that it shall be administered by a state agency. The reason for this is that at the time the act was written there were five different types of state agencies administering programs for crippled children—state health departments, state departments of public welfare, state departments of education, commissions, and in one or two cases a state university hospital. In a few states more than one state agency appeared to have authority under the state law. The problem then was before the Children's Bureau as to which state agency should be designated. The matter was presented to the solicitor of the Department of Labor, who advised the bureau that it was a matter for the state and not the federal government to determine. In those states in which there was no state agency administering the crippled children's program, the procedure was left to the governor and the state's attorney general.

DR. DEBUYS.—That is the deformed child, the orthopedic case, but you can have a child who might be crippled from some other condition and be disabled like a child with a cardiac disease. I do not think the point you made about a carious tooth includes a crippled child. It might be potentially he is crippled, but he would not come under the term of the crippled child.

DR. ELIOT.—That again brings up the question whether the crippled child should be termed "handicapped." As to "disabled children" it is difficult to know exactly, Dr. DeBuys, what you mean. The orthopedically crippled child may be disabled or he may be ambulatory.

DR. EDGAR E. MARTMER.—May I ask Dr. Eliot if she will define cooperation as it applies to the health departments and the medical profession in the various states.

DR. ELIOT.—That is another point on which we have not laid down any definite rule. I think that is something for the medical profession and state health departments to work out. You would like to know what we have accepted up to the present time.

It was obvious that, for the first five-month period of operation of plans, the evidence of cooperation had to be largely in the form of plans. The Children's Bureau pointed out, however, in the latest information bulletin that has to do with next year's plans, that the plan must show evidence of actual cooperation, as, for example, conferences between the state health department and medical groups or meetings of advisory committees.

DR. MARTMER (DETROIT).—In Michigan we had arising the situation in which we had the health department calling a meeting at which the various groups were represented after the plan had been promulgated and after it had been accepted. Under these circumstances, there was little use in calling a meeting. After they have spent the money, what is the use of calling a meeting to discuss how it might have been spent?

DR. ELIOT.—Every year there is to be a new plan. I think that before these annual plans are actually submitted the medical groups might well go to the state health department to discuss the plans before they are sent in.

DR. MARTMER.—What would be the attitude of the Children's Bureau in regard to the statement requesting cooperation with respect to teaching, so far as the medical profession is concerned, as outlined in the report of the committee?

DR. ELIOT.—We are very much interested in this and are glad to see any state include an item in the budget which will further such educational programs. As you know, the Children's Bureau has done some work in this field, both in obstetrics and pediatrics. We will continue to assist when the states request it.

DR. MARTMER.—In Michigan the Academy members as a group put on a postgraduate program each year. The only criticism of the plan of the state health department was its educational features. Education was provided for every cooperating group except the medical profession. As the state health department program was submitted no provision was made for the education of the group (the general practitioners) who will have to carry this work on after the Social Security Act, as it now stands, is discontinued.

DR. ELIOT.—We are very much interested in having the medical groups come in to help us formulate plans for teaching.

DR. MARTMER.—We had provision made for teaching the public health officials, for teaching the lay groups and every group except the general practitioner, who, after all, is the backbone of the situation.

DR. ELIOT.—There is evidently something for you to do.

DR. STERLING H. ASHMUN (OHIO).—I had supposed probably the same plan had been adopted in other states which we are fortunate to have in Ohio, as you well know. I think it might be interesting to other state chairmen to know the head of the state hygiene department is a member of the Academy. Dr. Van Horn, at the direction of the state health commissioner, directs nearly all of the present plans. Up to this time, he has placed four members of the Academy on his advisory committee. Being a member of the Academy himself, it looks to

me as though the cooperation in Ohio was pretty well insured. One thing he did which I thought was an excellent gesture and might be suggested to some of the other directors of hygiene or health or some of the others taking care of the work in a state was to write to the chairman of the state membership for the Academy to ascertain from the membership in the state what doctors were willing to help in any capacity in which they might be called upon.

Of course, that did not give me much idea of the capacity in which he might expect to call upon me. I wrote every member, and it was gratifying to have replies from over half the men in the state; some with very exclusive practices, some whom you would least suspect would volunteer their help, have come out wholeheartedly and have given assurance that in any capacity in which they can they will help to further this cause.

While in our state they plan to have an all-time man who is also a well-trained pediatrician, together with the nursing staff especially trained in maternity welfare departments; there will also be this other cooperation. If I am correctly informed, the plan as adopted in Ohio will certainly be a model for those who question what they mean by cooperation.

Our dental department is operating entirely separate from the medical and child welfare unit, and yet Dr. Van Horn, with the welfare unit, is making a special survey in Ohio of the pitted enamel teeth. How that is going to dovetail with the dental endeavor I do not know, but that certainly is a part of our department work. Although they expect to push their work into the counties where the needs are mostly rural, he expects to call on the men from the opposite end of the state so there will be no petty local jealousies, and they plan to pay them a satisfactory fee; at least that is the way it seems to most of those on the committee.

I might tell you that the advisory committee includes Dr. Gerstenberger, Dr. Horton, and Dr. A. Graeme Mitchell, heads of the department of pediatrics in three universities, and also me, as chairman of the state membership of the Academy. They plan to have these men go over the state. With the facilities Dr. Van Horn has at his disposal to carry on, the proposed fee was twenty-five dollars a day and expenses. I do not think he would mind my mentioning that. While that might not represent what your efforts are worth, it is certainly better than men have been paid before for similar work. It looks to me as though this plan should work successfully.

The feebleminded child, which has been terribly neglected in Ohio, is not provided for in any of the set-ups so far. We have more children already committed by the probate courts of Ohio who are on waiting lists for care than could be provided for in two more institutions. If the crippled child happens to be a spastic with some cerebral deterioration, he is liable to be out. The department of crippled children cannot take care of a child mentally deficient, and it seems the Children's Bureau is going to have to correlate the work of a lot of departments.

DR. ELIOT.—This brings up a subject which is very important in the whole Social Security Act and also in title V, namely, qualifications of personnel. Under the federal act the selection of personnel, like tenure of office and compensation, is under the control of the state. The federal government, however, must determine whether there is "efficient operation of the plan" and qualifications of personnel have a good deal to do with efficient operation.

We discussed in our committee yesterday how the state chairman can help state health departments by supporting them in the choosing of qualified people to do this work. If the Academy and the pediatric sections of State Medical Societies did nothing else than to insist on good appointments, this would help enormously in the program.

The state and territorial health officers have adopted a statement with regard to qualifications of personnel which has been very helpful to the Children's Bureau.

Not only do the states have advisory committees, but the Children's Bureau has advisory committees appointed by the Secretary of Labor. These federal advisory committees have also helped by outlining qualifications for different types of personnel.

The chairman from Ohio did not mention the program in which the state health department is going to cooperate with the obstetric hospital association in making a study of maternal deaths in hospitals, a very interesting part of the Ohio program.

DR. ASHMUN.—I do not know whether it is well known among our membership, but it was rather a new idea to me that practically all of this work in which we will participate is educational only. There will be no money spent in treating children who have been neglected. There will be simple programs to bring the men in the various counties more up to date in their method of treatment and treatment will be left to them.

There seems to be a bit of doubt in the minds of many of our membership as to whether by cooperating in this way they might not be contributing to state medicine. That is always the fear back in their minds, but it seems to me if this is worked out on plans similar to Ohio's, it will be one of the finest factors for really uniting the whole medical unit in their own defense rather than making it in any way state medicine. All of this matter of treatment and immunization will be done absolutely by men in their own counties, not by men in other parts of the state.

DR. ELIOT.—The programs vary in different states with respect to this. There is no medical care of the sick in connection with the maternal and child health services. In certain states as part of their program, the state health departments may organize either child health conferences or other types of work that individual physicians in the rural communities may do in their offices, especially in communities where the population is scattered and where it is difficult to develop local services. That is one of the conditions in the federal act.

The state health departments organize conferences, prenatal or child health, the purpose of which is primarily educational. They are for those women who are not able for various reasons to take their children to their own private physicians.

The situations and needs in the various states are so different that obviously the plans must be different. The states are indeed working things out according to their own needs, and we are quite delighted with the fact there has been so much variation.

PRESIDENT DIETRICH.—Thank you very much, Dr. Eliot. I am sure you have helped to clear up many things about which we were in doubt.

The next order of business will be a report of the Committee on Hospitals by Dr. Munns.

**Report of the Committee on Hospitals**

DR. MUNNS.—Although the committee has done a great deal of work the last year, the report will be brief. We have completed and published reports on children's hospitals and pediatric sections of the general hospitals throughout the United States and Canada the past year. This year, we have cooperated with the Committee on Medical Education to prepare and publish a report giving detailed information concerning the house officer positions throughout the hospitals in this country and Canada. These positions include internships, assistant residencies, and residencies in the various hospitals. At the present time the committee is

preparing a detailed report concerning the contagious disease hospitals in this country and Canada. The first section of this report has already been completed and is now in the hands of the publisher. The remainder of the report will appear in either two or three sections which will be published in later editions of the JOURNAL OF PEDIATRICS [volume 9, pp. 125, 377, 818 and volume 10, p. 136].

SECRETARY GRULEE.—I think, in connection with this report, it might be well to say in addition to this we found that the conditions throughout the country with regard to contagious disease hospitals are, to say the least, abhorrent. In most instances the so-called hospitals designated as contagious disease hospitals are nothing more than pest houses, with no status, no nursing facilities, nothing but a place to put somebody so he will not infect somebody else.

In the nature of things, it seems to me it is almost impossible to expect a small community to develop its own unit for care of contagious disease. The only way out of that is to educate the community to see that some portion of some hospital be set aside for such a purpose, and for that purpose the community as a whole should pay the expense. If that were done, operations such as for mastoiditis during scarlet fever could be assured fairly favorable conditions for their performance. I refer to the mastoid operation because in the Municipal Contagious Hospital, Chicago, a year ago last spring, there were eighty-six mastoid operations necessary following scarlet fever infection.

While that represents a group of about 500 cases a month over a period of six months, it still represents a considerable number of mastoid operations that were considered necessary by reputable men. What is a child in the small community to do under such circumstances? He cannot be taken to a hospital because they will not accept him in the hospital ward or in the operating rooms or in the private rooms. Some provision should be made for the child with contagious disease to be taken care of some place other than in the home in the small community.

That provision can be made, as I see it, only if certain portions of certain hospitals are set aside to take care of that need, and the public service, whatever it may be, municipal, county, or state, pay the cost. The condition is deplorable. I had no idea of what it was until we got into it. There are very few contagious disease hospitals in this country that are worthy of the name.

In a city like Chicago, there are only two places where a person with a contagious disease can be taken. In Cook County there is one other hospital where patients with contagious diseases can be taken. That represents a population of something like four million people, and the condition there is much better than it is in many parts of the country.

I was discussing the matter with the late Dr. Dennett and with Dr. Murray Bass. They said they knew of no place in New York where they could take a contagious disease case except the Willard Parker Hospital. That may or may not be true in New York, but that was the only place of which they knew. Something ought to be done for these children.

DR. MUNNS.—A great deal of what I have to say will appear in the report, but, since Dr. Grulee has mentioned it, I thought you might be interested in knowing the number of contagious disease hospitals found in the various regions of the Academy. In the Middle West, or Region III, there are just 26 contagious disease hospitals which can really be called contagious disease hospitals. In the Far West and South, Regions II and IV, there is a total of 23 contagious disease hospitals. In Region I, the East, there is a total of about 35 contagious disease hospitals, so you may see that the total number of contagious disease hospitals throughout the United States is not great. There are many other hospitals which are listed as contagious disease hospitals, but judging by the information given when the questionnaires were returned, it became quite obvious that they were really not contagious

disease hospitals. They were just separate buildings, possibly with one or two beds and a maid or so to take care of the building. There were no laboratory facilities or other equipment found in good contagious disease hospitals. In other words, they were just houses in which to put a patient who had a contagious disease and whom they did not wish to have near other people.

DR. ASHMUN.—Was there any follow-up on these? Was there any communication with the various hospitals, and did they get reports so they would benefit by these questionnaires?

SECRETARY GRULEE.—They will not have those yet because we have not compiled our report; we will probably put in a complete report, not modified but abridged, in the *American Hospital Association Bulletin*, where we have published all our reports heretofore, as well as in the JOURNAL OF PEDIATRICS. But really, Dr. Ashmun, that is not what meets the situation. Those hospitals are not hospitals, and in the smaller communities they are almost entirely politically controlled. They are a disgrace to the United States as a whole.

DR. ASHMUN.—I was thinking of the other element. In those which I visited there was considerable difference, for instance, in the infant and newborn death rates and in their maternal care, even in the most modern hospitals. Some of them have extremely high death rates. I wondered whether anything had been said to them calling their attention to that. They have superintendents appointed by politicians. I wondered whether the report would work to the good to which you intend to have it work.

SECRETARY GRULEE.—Of course, we can only do that by bringing pressure to bear from the medical profession, and perhaps the women's organizations in the state. If, for instance, we could call the attention of the League of Women Voters to the condition of contagious disease care in the United States we might be able to get some place. We have not considered that phase of it at all, because we have just arrived at the point where we are getting our statistics together.

Many of those hospitals, as Dr. Munns has said, have nobody to take care of patients except a maid. The only medical care they get is from some health officer. Something should be done about that situation. What we will do I do not know, but the reports will be available in the Bulletin eventually.

DR. MARTMER.—I am wondering, Dr. Grulee, if it would be of any benefit if a definition of what we consider a suitable institution could be drawn up and transmitted to the American Medical Association with the list of those hospitals that fall under that classification and perhaps along with that a list of those that do not, calling their attention to the matter. It this the proper method of approach to the American Hospital Association?

SECRETARY GRULEE.—The American Hospital Association would do more with it, I think. How much they would do I do not know. I believe the pressure will have to come from without as well as from within, not because of the hospitals themselves but because of their control which is essentially political.

DR. MARTMER.—If you could bring it first to the attention of the American Hospital Association and have it on record, then, taking it from the other angle, either to the Academy or to a state group of the Academy, would not this be the proper procedure?

SECRETARY GRULEE.—We can go to the American Hospital Association because we have access there, and they are very receptive. They are glad to get our material and have been very cooperative. I do not know what we had better do, but something should be done. It must be a campaign not of a year or two

years but of twenty years perhaps before we can get any place with it. It is not a problem which will be solved in a short time. Part of the difficulty is due to prejudice against contagious disease in hospitals on the part of laymen who feel that a contagious disease hospital is a sore spot in the community.

DR. MARTMER.—Is not that brought on, unfortunately, by the attitude of a large portion of the medical profession? For example, I am consultant in one of the hospitals. A patient develops erysipelas, and the hospital physicians immediately want to move the patient out of the hospital.

SECRETARY GRULEE.—Most hospitals will take care of contagious disease that develops within the hospital because they are afraid not to, but that is not the big problem.

PRESIDENT DIETRICH.—We will proceed to the next report, that of the Committee on School Health and School Health Education. Dr. LeRoy A. Wilkes is chairman.

DR. WILKES.—The Committee on School Health and School Health Education has submitted its report, which will be distributed. The one outstanding thing which impresses me continually, and the schools are only one example, is the failure of different community groups to state clearly their aims and particularly their scope of function. I think educational institutions have a tendency to get into medical practice; social agencies have the same tendency. In discussion in the New Jersey Social Conference this year, in which I happened to sit as a member, one of these agencies reported its next move was to form a health section. I asked what was to be the purpose of the health section in this conference, and the representative stated it was to take care of those medical cases that held back the social work in the community.

I asked whether they felt competent to take care of the medical phases, of the interfering factors that came up in social work. They said, "Yes we are, we will just get a doctor. The doctors are very kind to us so we will get them on our staff and refer the cases to them." I suggested it might be outside their proper scope of function; there was already a community agency founded primarily for that purpose, and I thought, if they would define their medical problems and submit them to the organization founded primarily for that purpose, the social workers would probably achieve their end more quickly and more completely than by attempting to insert in their organization a medical service section.

To their credit, I will say, they said, "Yes, we never thought of that." I think we might suggest to agencies founded for purposes other than health service, our readiness to help them, as a medical service agency, in the solution of their problems if they will stop trying to invade our field, will define their problems as they relate to medical service, and will request our cooperation.

I was very much surprised at the readiness with which the group in New Jersey seemed to realize that this was a better procedure and accepted it without question, and they immediately formed a health service section whose stated purpose and scope of function was merely to define the medical service problems which they encountered in their primary aim of social work and to present them to the proper community agencies.

If we would suggest to other groups that there is a proper scope of function for each community agency and that community agency services can never become integrated until each one understands what his peculiar and particular responsibility shall be, it would be the proper procedure. That applies to the schools and the social agencies of various types, and I think they are quite susceptible to the suggestion.

The remainder of the progress report of the Committee on School Health and School Health Education will be presented to you tomorrow in mimeographed form.

PRESIDENT DIETRICH.—Does the Committee on Medical Education have a report to make at this time?

DR. HELMHOLZ.—Mr. President, Dr. Veeder, the chairman of the committee, is not present. I have not the report well enough in mind to say anything more than that it deals entirely with graduate pediatric education and that, as was discussed, it seemed important that not only the matter of graduate education be studied, but also undergraduate education, as well as the giving of pediatric refresher courses to the general practitioner. It was our feeling that possibly it would be advisable to have one large committee consisting of three subcommittees to take care of these three distinct parts of medical education.

DR. M. HINES ROBERTS (GEORGIA).—As I sat in the meeting of the Committee on Child Health Relations yesterday, it occurred to me we would be extremely fortunate if many of the problems discussed there could be brought before the general meeting. It seems to me in the past few years fewer and fewer of these problems have been brought before the membership as a whole.

In the state of Georgia it has been very difficult for me to go back from these state chairmen meetings and put the problems over in the form in which we receive them in our committee meetings. It seems to me very worth while to consider devoting more of the time of our program to these public health problems rather than devoting the entire program to scientific problems.

PRESIDENT DIETRICH.—The Executive Board almost each year has tried to vary the program somewhat, and this subject is under discussion now. I would not be surprised if there would be a place on the program next year for discussion of that type.

SECRETARY GRULEE.—In other words, we plan to hold a longer meeting next year, probably a three-day meeting; perhaps half a day could be devoted to that purpose, with the entire membership present.

DR. CLIFFORD SWEET (CALIFORNIA).—I would like to make a short statement in regard to the JOURNAL OF PEDIATRICS. I have been discussing the matter with Dr. Veeder through correspondence this year: perhaps if I mention it here, some of you may think about it. I would like to see the JOURNAL OF PEDIATRICS have a department concerned with practical everyday things relative to the life of the child. I tested the matter out this year by inducing a friend from Oakland to submit an article on the mechanics of blowing the nose. It was promptly sent back from the JOURNAL OF PEDIATRICS because it was said to belong in a journal of the ear, nose, and throat. I asked Dr. Veeder whether it was not more practical to have this article appear in the JOURNAL OF PEDIATRICS where it would reach the people most concerned or whether it should appear in the *Archives of Pediatrics* where it would be brought to the attention of only a few people.

SECRETARY GRULEE.—I would like to speak on this from the other angle, that is the angle of the person editing the JOURNAL.

I wonder if any of you realize the amount of material which comes to a man who is editing the JOURNAL. I wonder if you realize how soon his journal would contain nothing but that material if it were presented in each issue. I do not believe the JOURNAL OF PEDIATRICS can afford to do what Dr. Sweet wants it to do unless it is done in the form of a supplement and done as an educational pamphlet in connection with the JOURNAL, subsidized from outside agencies. We have

committee reports; we have round table reports; we have panel discussion reports. We have reports of the national organizations, reports of the Executive Board, reports of the various regions, all of which are now published in our JOURNAL. I think one of the most popular points of the JOURNAL is its comprehensive reviews. If the JOURNAL is to be of value, it must meet the demands of a varied group of individuals, and while it might meet the needs of this group in connection with some of these suggections, it would not meet the wide needs.

Personally I think it would be far wiser to leave this matter in the hands of the editorial board in the first place; and in the second place, if we were to publish anything of that sort, it would be more advisable to provide some funds for a further increase in the size of the JOURNAL with that in mind rather than to ask them to take on that added burden. I speak feelingly because I have had this problem to confront for a good many years.

DR. SWEET.—I do not wish to be understood as criticizing the editorial board. I feel there is great need for the presentation of the practical points which touch the lives of our children every day, in an authoritative manner to the people who can make use of them. I wonder how many pediatricians of this country are having children sent to the ophthalmologist routinely for study before the children enter school?

There are many thousands of children in the United States today blind in one eye because they did not learn the use of both eyes in childhood. A good many have been attempting to send their patients to the ophthalmologist at four, five, or six years in order to have a complete eye examination. That is not generally being done. I asked an ophthalmologist who writes well to send a paper on this subject to the JOURNAL OF PEDIATRICS, and again he received the reply this should be entered in a journal for ophthalmologists. The ophthalmologist does not see the child until he has difficulty with the eyes. We see the child and are in a position to find out whether or not he has difficulty.

I think these illustrations bring to your attention what I have in mind, that the JOURNAL OF PEDIATRICS should encourage the writing and publication of papers which concern the problems of the child in our everyday practice, insisting, of course, that these papers be well written, do not deal with controversial aspects of the subject in hand, and be presented in a clear manner so that the pediatrician and general practitioner everywhere will be instructed and the children of this country be greatly benefited.

SECRETARY GRULEE.—I do not question the advisability of the suggestions which have been presented. The only thing I question is whether it is up to us to do it under those circumstances and in that way.

PRESIDENT DIETRICH.—I think in connection with problems of this sort a great deal of good can be accomplished if they are presented at this particular meeting, because every state is represented here. Even if nothing can be done, it gives the members an opportunity to take home some new thoughts, to discuss them, and perhaps, if they are again presented to the Academy in the future, to do something with them. After all the Academy is still a very young organization. We have to change our plans from year to year and have to leave some things out and add other things. I think that ought to be borne in mind. We have progressed quite rapidly, but there is a limit in regard to what the Academy can do each year.

If there is nothing further to be brought before this body, I shall entertain a motion to adjourn.

Motion to adjourn was properly made, seconded, and carried, and the meeting adjourned at 10 P.M.

# REPORT OF THE COMMITTEE ON HOSPITALS AND DISPENSARIES

## A Review and Summary of the Reports on Contagious Disease Hospitals in the United States and Canada

Committee on Hospitals and Dispensaries: Dr. Clifford G. Grulee, Chairman; Dr. George F. Munns, Secretary; Dr. Murray H. Bass, Dr. Laurence R. DeBuys, Dr. Henry Dietrich, and Dr. Lewis Webb Hill.

The following is a résumé of the detailed accounts which appeared from time to time in the Journal of Pediatrics as reports from the Committee on Hospitals and Dispensaries of the American Academy of Pediatrics.

One hundred three hospitals received questionnaires from the committee. From among those returned, 88 were used to compile reports which have been published in current issues of the Journal of Pediatrics. Fifteen hospitals did not reply to the questionnaires in complete enough form to warrant their use, or the reply received indicated that they could hardly be classified as contagious disease hospitals. They were more of the nature of pesthouses.

South of the Ohio River and west of the Mississippi River there are few contagious disease hospitals. Only six questionnaires were received from the former region and only twenty-eight from the latter. Twelve of the twenty-eight were from California. There are several states in each region of the Academy of Pediatrics which do not have hospitals for the care of contagious diseases, and only two cities in all of the United States and Canada have more than one contagious disease hospital.

The attending staff, in most instances, is not a full-time one. Specialties are well represented on the attending staff of the hospitals, and among the larger institutions these men visit at regular intervals. Among the others they are, as a rule, only on call. Patients of many of the hospitals are not under the exclusive care of the attending staff. This means that their own physician may bring them to the hospital and care for them there, though he may not be a member of the staff.

Uniformly, these hospitals require the attending physician to have a doctor of medicine degree and be in good standing in his community. About two-thirds of the hospitals employ resident physicians and as a rule require them to have at least one year of previous hospital experience. There are a few that require only a doctor of medicine degree to qualify for that position. Generally, one thinks of a resident physician as an individual who has had at least one and preferably more years of previous hospital experience. We believe that at least one year of previous hospital experience is necessary to enable the average young physician to administer efficiently the duties of a resident. A contagious disease hospital which employs a physician whose only recommendation is a doctor of medicine degree and permits him to assume responsibilities that the title implies must certainly have a weak spot in the organization at that important point. There are, of course, certain small hospitals which at some period during the year have very few or no patients. This situation would make it extremely difficult for them to secure a man of previous experience, for he would not care to waste his time where patients are few but would seek experience in the larger institutions with active year-round services. About one out of five hospitals employs an assistant resident, and in most instances at least one year of previous hospital experience is required in order to qualify for this

position. Slightly less than half of the hospitals employ internes, and in most instances previous hospital experience is not required. Generally, the length of the service is less than six months.

The committee is of the opinion that information concerning house officer positions reveals a rather serious weakness in the training of the average young physician for the practice of general medicine. A thorough knowledge of contagious diseases is an extremely valuable asset to the general practitioner and, as far as that goes, to any other practicing physician. Judging by the number of house officer positions available in contagious disease hospitals, we are led to conclude that many men probably complete their hospital training without adequate contagious disease training and possibly some of them without having ever seen more than very few cases of contagious disease.

Slightly more than one-third of the hospitals (25) are connected with medical schools and among a slightly larger number, the clinics or ward rounds are available to medical students. In general, it might be said that the hospitals which are connected with medical schools usually have a superior organization and equipment. Fewer than one-half of the hospitals have observation wards or cubicles or private rooms which might be used for observation purposes. Among those hospitals having these facilities, new patients are usually retained there until a positive diagnosis is made. It would seem that some form of isolation unit is essential to any contagious disease hospital, and, when our figures indicate that more than 50 per cent of them do not have this type of unit, we wonder if perhaps our questions were not clearly understood.

Slightly more than two-thirds of the hospitals take routine throat cultures for diphtheria on admission. Fewer than one-half take them for hemolytic streptococcus, and fewer than one-third take routine vaginal smears. Routine blood counts are done in fewer than one-half of these institutions, and four-fifths of these hospitals take routine urinalyses on admission. Among nine-tenths of them routine histories and physical examinations are done. Information was also secured concerning routine procedures such as Dick, Schick, von Pirquet, Mantoux, and Wassermann tests. Most of the hospitals perform this latter group of tests only when indicated. There were a few in which they were routinely performed. We believe that the routine procedure of contagious disease hospitals where patients are placed in wards, and particularly is this true among children, should at least include throat cultures, blood counts, urinalysis, and vaginal smears and complete history and physical examination. Too many of the hospitals which replied to this questionnaire omitted one or more of these procedures.

About two-thirds of the hospitals are located in rather quiet residential districts; the remainder are located in noisy, rather undesirable locations. Slightly less than two-thirds of the hospitals are small institutions, each having only one or two floors. Slightly over one-third of the entire number have bed capacities of fifty or less; about the same proportion have one hundred or more beds; and a similar number have a bed capacity between fifty and one hundred. Thus, about two-thirds of all the hospitals have fewer than one hundred beds and hence cannot be classified as large institutions. These figures should be kept in mind as additional information concerning various departments of these hospitals is revealed. Most of the hospitals have wards and about two-fifths of them have all or part of their floor capacity in a cubicle system.

Among all hospitals there were 4,696 ward beds. Hospitals found in Regions I and III supplied more than four-fifths of the total number. About three-fifths of the hospitals accept all types of contagious diseases. Some exclude certain types, usually such as erysipelas, measles, chickenpox, pertussis, gonorrhea, and syphilis. Surprisingly, two exclude diphtheria, and several exclude typhoid fever. Among the larger hospitals which usually have greater facilities for isolation of patients, ex-

clusion of certain types of contagious disease is usually unnecessary. However, the smaller institutions may have less space for individual isolation; their nursing facilities are more limited; and it is probably imperative for them to exclude certain types of disease in order to protect other patients.

Figures on the total admissions to these hospitals reveal only twelve institutions in the entire group which had admissions of 5,000 or more patients in any one or more of three years, 1932, 1933, and 1934. Exactly two-thirds of the hospitals did not admit over 1,000 patients in any one of the three years. The percentage of deaths in hospitals of Regions II, III, and IV is about the same for the three years, 1932, 1933, and 1934, but was almost one-third lower than among the hospitals of Region I. In fact, during one year, 1933, the percentage was two-thirds less. We are unable to account for this marked difference in death rate.

Practically all hospitals accept both white and colored children. In Region II all are segregated; among the hospitals of the other three regions, twenty-five segregate white and negro patients. No hospital limits the number of negroes who may be admitted. There were at least twelve hospitals in which all beds are charity beds, but we did not hear from all the institutions in regard to this question. A large number have from 50 to 90 per cent charity beds, and probably less than 2 per cent of the institutions have all strictly pay beds. Only thirteen hospitals provide accommodations for mothers to stay with their sick children. Most of the hospitals in every region are supported entirely by county and city funds. Only one institution reported that it is aided by state funds, and no hospital derives its entire support from endowment. There are a few which are partially supported in that way. Only two hospitals receive aid from the community chest, but four are entirely supported by private contributions.

The cost per patient per day revealed interesting variations. The lowest figure reported was $1.82 and the highest $6.53. This rather marked difference in cost can be interpreted as you please. A low figure may suggest inefficiency, inadequate equipment, and poor care and food. On the other hand, a high figure may also mean inefficiency and needless waste with no better food, care, or equipment. Our attempt to obtain detailed information concerning supplies, food costs, nursing costs, etc., was in most instances unsuccessful. Among the few replies received, there was again a great difference in figures.

About three-fifths of the hospitals employ men superintendents; the remainder employ women. About one-half of the superintendents are physicians; one-fourth are registered nurses; and the remainder are lay people. Many of these officers are probably well trained and capable, but the committee wishes to emphasize a point made in an earlier report. We believe that the position of superintendent of any hospital, particularly a large hospital, requires a thorough preliminary training in hospital administration and that the mere possession of a doctor of medicine or registered nurse degree together with a smattering of practical experience is not in itself a complete qualification for that position.

The nursing organization of many hospitals seems to be excellent but among a few appears to be decidedly inadequate. About two-fifths of the hospitals are affiliated with other hospitals for special training of nurses. A somewhat larger number offer courses in contagious nursing technic. These courses vary in length of time from three weeks to three years. The average affiliate course is about three months. We doubt that any period of less than three months' training could be of very much value. One-half of the hospitals employ only graduate nurses. About two-thirds of the hospitals immunize the nurses to diphtheria and about the same number vaccinate them against smallpox. Fewer than one-half immunize to scarlet fever, and about one-third immunize to typhoid fever. Nurses contracted diphtheria in only ten hospitals and scarlet fever in only twelve. Only one nurse in all of the hospitals contracted smallpox. Among about one-fourth of the hospitals nurses

contracted other contagious diseases such as mumps, measles, poliomyelitis, etc. Among most of the hospitals the total number of nurses who contracted one of the contagious diseases was small. A larger number had scarlet fever. In those instances in which immunization is possible, it is a most sensible routine procedure when applied to individuals in constant close contact with contagious disease. We believe that all contagious disease hospitals should afford their nurses that protection.

The information which we received concerning the number of nurses on day and night duty, the length of their assignments, etc., was generally unsatisfactory, probably because of a misunderstanding of the questions asked. We are unable to give accurate figures concerning this information. In general, most of the hospitals seem to have an adequate number of nurses on duty at any one time. In a few institutions the nursing care seemed to be decidedly inadequate both day and night. As a rule, among those replying, a graduate nurse is found in charge of the wards both day and night, but many did not reply to this question, which makes us wonder whether ward supervision in many hospitals is what it should be.

Figures on cross-infection, too, are not as instructive as they should be, as many hospitals failed to reply to this portion of the questionnaire. However, what information we have indicates that these infections are not uncommon. Measles and scarlet fever were the most frequent offenders. Chickenpox was also a common offender. Diphtheria as a cross-infection was infrequent. It occurred seven times in fifty-three hospitals, and three of these cases occurred in one hospital. Measles and varicella were the only diseases that occurred frequently as a cross-infection in any hospital. Several institutions reported as high as forty or more cross-infections with these diseases within a year.

Two-thirds of the hospitals have a special operating room. Relatively few operations are performed in contagious disease hospitals, but one is curious to know what happens when it is necessary to operate upon a patient in any of the hospitals (about 30) which have no operating room.

Comparatively few of the hospitals have special kitchens for the preparation of infants' and children's diets. Some of the larger hospitals have them, but they are usually lacking in moderate-sized or small hospitals. In these small institutions, a special diet kitchen may not be practical or necessary. However, any hospital having a fair-sized, active service with children and babies frequently among the patients should have a special kitchen for the preparation of their food. Our information indicates that diets for both children and adults are not well handled in several of the hospitals.

## X-RAY SERVICES AND LABORATORIES

Fewer than one-third of the hospitals have no facilities for x-ray work. This means that neither have they a department of their own nor is a department in another institution available. In the larger institutions complete x-ray service is usually available. In the smaller institutions often it is available for diagnostic purposes only. Among those institutions which are part of a large general hospital, the x-ray department of that hospital usually serves the contagious disease division. The x-ray may not be used relatively as frequently in contagious disease work as it is in general medicine, but one can think of many instances in which its aid is a decided advantage, and often the information which it may give is essential. Therefore, when we find that about 33 per cent of contagious disease hospitals in this country have no facilities for x-ray work, we believe that another marked weakness has been revealed.

Nearly one-third of the hospitals employ a full-time director of laboratories. This position includes supervision of pathologic, clinical, bacteriologic, and serologic laboratories. About two-thirds of them employ either a full-time or a part-time

director. Laboratory work in about one-third of the hospitals is done by the city or state health departments or by the laboratory of another hospital. More than one-third of the hospitals have a full-time director of the pathologic department, and about two-thirds of them have either a full-time or part-time director. In many instances, these men are also the directors of the laboratories of a general hospital of which the contagious disease hospital is a division and, of course, the laboratory work of the contagious disease hospital is done in the laboratories of the general hospital.

The percentage of autopsies for all hospitals is a little better than 50. Among the larger institutions this percentage will average much higher than this figure, but several of the smaller hospitals which report few or no autopsies pull the general average down considerably.

Slightly less than one-half of the hospitals have full-time directors of the clinical laboratory, and slightly more than one-half have either a full-time or part-time director. More than one-half of the hospitals employ full-time technicians in the clinical laboratory and among slightly less than one-half the interne performs part of the routine work.

Many institutions have well-equipped laboratories, including facilities for blood chemistry work, basal metabolism tests, etc. About two-fifths of them have facilities for research work. All institutions did not reply to this question, but of those who did, about 10 per cent considered their clinical laboratory facilities inadequate. About two-fifths of the hospitals have full-time directors of the bacteriologic laboratory, and two-thirds have either full-time or part-time directors. In about one-third the interne performs some of the laboratory work, usually of a routine nature. More than one-half of the hospitals employ full-time technicians and more than one-half keep animals for experimental purposes. About one-half have facilities for research work; again, more than 10 per cent considered their laboratory facilities inadequate. About two-fifths of the hospitals have full-time directors of the serologic laboratories. Almost one-half have either full-time or part-time directors, and one half have full- or part-time technicians. The internes have duties in the serologic laboratory in only ten hospitals. About two-fifths of the hospitals perform their own Wassermann tests, and the same number are equipped for research work. Again, about 10 per cent or more consider that their laboratory facilities are inadequate. About two-fifths of the hospitals have facilities for photography, and almost one-half have an electrocardiograph available.

In general, one might conclude that laboratory work done in many of the hospitals is not very complete, and, judging from information from the laboratories alone, we might say in many instances this work is inadequate. However, we must not lose sight of the fact that many of the institutions concerned in this report are small and that for them complete laboratory organization with full-time technicians would be a prohibitive expense. In most instances, these smaller hospitals have access to the laboratory of a large institution or to the laboratories of the department of health in their respective city or county. We are sure that in about 10 per cent of the hospitals the laboratory facilities are inadequate, for at least that number so replied to that section of the questionnaire.

Trained dietitians are in charge of the diet kitchens in about one-half of the hospitals. Most of these dietitians seem to have had adequate training, while a few have not. In some institutions the patients' food requirements are left to the tender mercies of a cook or maid. At first sight this does not seem to be a very satisfactory arrangement, although there are some cooks to whom we would rather trust the gastronomic peculiarities of our patients than to the cold logic of standard diets.

In about one-third of the hospitals, standard special diets are drawn up by the attending physician alone. In about one-fourth the physician and dietitian cooperate,

and in more than one-fourth the dietitian alone arranges the diet. In general, the diets seem to be well supervised. The larger hospitals all employ trained dietitians, and we suppose that among the smaller institutions they cannot afford to pay special dietitians unless their work is combined with other duties.

About two-fifths of the hospitals maintain a social service department or are served by the social service department of a large general hospital. Almost all of these departments have a full-time worker in charge, who in most instances, with the exception of two or three, has had special social service training. Many of the larger hospitals have more than one full-time worker. About two-fifths of the hospitals investigate all patients who are admitted. In two-thirds of them this work includes home visits. The remainder gain their information solely through contact with patients and relatives who visit the patient in the hospital. Slightly less than one-third of the hospitals take complete social histories, and almost three-fourths of them file the social history with the medical history. Among the remainder an abstract is usually filed. About one-third of the hospitals investigate the ability of the patient to pay for hospital services.

Less than one-fourth of the hospitals have available convalescent homes, and about the same number have foster homes. Many of the hospitals consider their facilities for convalescent care inadequate, particularly in the case of children. This complaint is made not only by hospitals who have no facilities for convalescent care, but often by those who report that they have access to such facilities. In general, we are forced to conclude that facilities for convalescent care among contagious disease hospitals need considerable improvement and enlargement.

Slightly more than one-fourth of the hospitals routinely follow up discharged patients. Usually the social service department does this work. Very few of the hospitals use volunteer workers. Most of the social service departments are supported by hospital funds, although there are eight departments in Region I which are supported by outside funds. In very few hospitals is there a lay committee in charge of the social service department. Physicians are members of this committee in three instances. Lay committees may be valuable aids to the social service departments, but certainly no such committee is qualified to direct activities of that department, even if the committee includes a physician or two.

During 1934 these hospitals cared for 4,462 cases of diphtheria. The average mortality was 7.2 per cent. These figures indicate that much remains to be accomplished in the campaign for eradication of diphtheria. In the same year 26,246 cases of scarlet fever were admitted to these hospitals, a number larger than all other contagious diseases admitted to the hospitals combined. The average mortality was 1.45 per cent. With increasing use of preventive measures, one should expect to see the first figure considerably lower during the next few years and with more widespread and intelligent use of new forms of treatment, we should also expect to lower the mortality rate. Proper use of convalescent serum and the Dick serum gives us two fairly effective weapons of combating this disease. There were 5,917 cases of measles admitted to these hospitals in 1934. Region III seemed to suffer an unusually violent type for their mortality rate was twice that of Region I and more than six times that of Regions II and IV. The rates respectively are 6.3 per cent, 3.1 per cent, and 0.96 per cent. About the same number of cases of pertussis as of measles were cared for in these hospitals. The average mortality was 7.9 per cent, provided that the figure for one hospital is not included. This particular institution in Region IV reported 1,824 cases of pertussis in 1934 with the remarkably low mortality rate of 1.07 per cent. The mortality figure of 7.9 per cent should emphasize once again that pertussis is one of the most dangerous of the contagious diseases. A factor in this situation, however, must be that usually only cases of this disease with complications are hospitalized. Smallpox, against which we have waged a campaign for many years, caused only one death among a total of two hundred

and fifty-six cases admitted to these hospitals. In Region I only one case was admitted among all the hospitals, and it was a fatal case. That figure speaks well for preventive work in that region. Region III cannot be so proud of their record with fifty-six cases reported. In Region II, only four cases were reported, but in Region IV, one hundred and ninety-seven cases were reported with about seven-tenths of these being reported from one hospital (17). Among 4,824 cases of chickenpox the mortality rate averaged 0.3 per cent. Among 383 cases of epidemic cerebrospinal meningitis, the mortality was 43.9 per cent, a rather discouraging figure indeed, but probably destined to be lower in the future when recently improved methods of treatment are more widely used.

Figures on other contagious diseases reflect outbreaks of various epidemics in different parts of the country, such as the amebic dysentery epidemics in Illinois, the encephalitis epidemic in Missouri, and typhoid fever outbreaks in several cities. More detailed information on these epidemics is given in previously published reports.

## SUMMARY AND SUGGESTIONS

It is readily seen from this review that the contagious disease hospitals of the United States and Canada are far from being what they should be. There is perhaps some excuse for the lack of x-ray facilities in so many, but this can certainly not be urged for the inadequacy of their laboratory facilities. These criticisms hold true for many of even the larger hospitals. It would seem that under the circumstances some other provision for the care of contagious disease cases should be made than is at present available.

Would it not be better in smaller communities for the contagious cases to be taken care of in connection with some well-recognized hospital where general facilities on the care of sick patients are available? This could be done by most communities without any increase in cost and would certainly result in better treatment of the patients. This does not visualize the necessity of including these cases on a floor of the hospital, but there should be some definite physical connection, and certainly, if it did nothing more, it would make available nursing care and medical attention which is not readily attainable in most instances.

It should be borne in mind that this survey covers a comparatively few of the hospitals which are designated contagious disease hospitals. As a matter of fact, most of the smaller ones which have been eliminated are used simply as places to put patients with contagious diseases so that there will not be a danger to the community, but without any, or at best inadequate, care for the patient himself.

This report completes the review of contagious disease hospitals.

The committee takes this opportunity to thank all persons in this country and Canada who so kindly took the trouble to see that the questionnaires were filled out and returned to us.

# News and Notes

The **American Board of Pediatrics** reports the results of three examinations held in October and November.

On October 22, in San Francisco, 19 men were examined. Ten were passed, and 9 failed. Of the number passing, one was in Group I, 5 in Group II, and 4 in Group III. Of the number who failed, 3 were in Group I, one in Group II, and 5 in Group III. Figured on a percentage basis 52+ per cent passed and 48– per cent failed.

On November 15, in Baltimore, 34 men were examined. Twenty-five were passed, and 9 failed. Of the number who passed, 2 were in Group I, 10 in Group II, and 13 in Group III. Of the number who failed, 2 were in Group I, 5 in Group II, and 2 in Group III. The percentage on this examination shows 73.5 per cent passed and 26.5 per cent failed.

On November 19, in Cincinnati, 32 men were examined. Twenty-six passed, and 6 failed. Of the number who passed, 3 were in Group I, 6 in Group II, and 17 in Group III. Of the number who failed, 2 were in Group I, one in Group II, and 3 in Group III.

Grouping these three examinations together, 85 were examined: 61, or 71.8 per cent, passed and 24, or 28.2 per cent, failed. Of the number who passed, 6 were in Group I, 21 in Group II, and 34 in Group III. Of the number who failed, 7 were in Group I, 12 in Group II, and 10 in Group III.

The following men and women have been certified by the **American Board of Pediatrics** since the last report. Fifty-one of these men and women were examined.

Jessie M. Bierman, Helena, Mont.
Kenneth Blanchard, East Orange, N. J.
George E. Brockway, Brooklyn, N. Y.
Leon H. Dembo, Cleveland, Ohio
Banice Feinberg, Providence, R. I.
Sandor A. Levinsohn, Paterson, N. J.
Harry A. Ong, Washington, D. C.
Edward Warren Ripley, Montclair, N. J.
W. Russell Smith, New York, N. Y.
J. Hart Toland, Philadelphia, Pa.
Frederick H. von Hofe, East Orange, N. J.
James Robert Adams, Charlotte, N. C.
William Staton Anderson, Washington, D. C.
John Edmund Ashby, Dallas, Texas
Leo Batell, Forest Hills, N. Y.
Allan Penny Bloxsom, Houston, Texas
Maxwell Bogin, Bridgeport, Conn.
Carl C. Fischer, Philadelphia, Pa.
Kenneth B. Geddie, High Point, N. C.
Thomas Archer Gibson, Winchester, Va.
Ernest Foster Gordon, New Haven, Conn.
Algie S. Hurt, Jr., Richmond, Va.
Arthur Hill London, Jr., Durham, N. C.
Irving Matusoff, Brooklyn, N. Y.
Francis Charles McDonald, Boston, Mass.
Robert Carey McGahee, Augusta, Ga.
Rhoda May Mickey, Valhalla, N. Y.
Philip A. Mulherin, Augusta, Ga.

Julian P. Price, Florence, S. C.
Donald Edward Robinson, Burlington, N. C.
Allan Roos, New York, N. Y.
John M. Saunders, Nashville, Tenn.
Suzanne Schaefer, New Orleans, La.
Samuel Singer, Philadelphia, Pa.
Reuben Turner, New York, N. Y.
Robert O. Y. Warren, Wilmington, Del.
James Henry Bahrenburg, Canton, Ohio
Samuel Sidney Bernstein, Detroit, Mich.
William W. Briant, Jr., Pittsburgh, Pa.
Merlin L. Cooper, Cincinnati, Ohio
Robert J. Cooper, Pontiac, Mich.
Max Deutch, St. Louis, Mo.
Jerome Diamond, St. Louis, Mo.
Samuel D. Edelman, Columbus, Ohio
Ernest Ekermeyer, Xenia, Ohio
Arthur J. Horesh, Cleveland, Ohio
Irvin R. Itkoff, Cincinnati, Ohio
Rockwell M. Kempton, Saginaw, Mich.
Harry C. Kendall, Cincinnati, Ohio
Carl A. Koch, Cincinnati, Ohio
Daniel B. Landau, Hannibal, Mo.
Waldo E. Nelson, Cincinnati, Ohio
William Woodward Nicholson, Louisville, Ky.
Carl J. Ochs, Cincinnati, Ohio
Margaret Knight Patterson, Detroit, Mich.
Louise W. Rauh, Cincinnati, Ohio
Clare R. Rittershofer, Cincinnati, Ohio
Charles Lee Shafer, Mansfield, Ohio
Aaron Allen Shaper, Louisville, Ky.
Inman Smith, Trion, Ga.
J. Gay Van Dermark, Covington, Ky.
Maurice Bernard Weiner, Detroit, Mich.

Following the action taken by the assembly of the official delegates of the thirty-eight governments attending the first congress in Paris in 1933, the Second International Congress for the Protection of Infancy will be held in Rome.

The date, approved by the Italian government, is fixed for the days October 4 to 8, 1937, immediately after the Fourth International Pediatric Congress which will take place also in Rome, September 27 to 30, 1937, at the time of the bimillenarian celebration of the Emperor Caesar Augustus.

The official languages are English, French, German, Italian, and Spanish.

Admission to the Congress is open to all those who in the field of their respective activity take an interest in the multiform problems of the protection and assistance of infancy: doctors (pediatrists, obstetricians, hygienists), jurists, pedagogues, and administrators of works of assistance.

The subscription rate is 100 Italian lire. Those who wish the Transactions of the Congress should add 50 Italian lire. The fee must be sent to the treasurer of the committee Dr. Egidi, Corso Bramante 29, Torino 120.

The program of the Congress, with the dates of the inauguration, scientific meetings, visits, receptions, will be sent afterward to all subscribers.

For information concerning travel, railway rates, and reductions and for various facilities of sojourn (hotels, gasoline, etc.) foreign visitors should communicate with the bureaus of the Italian Company of Tourism (C.I.T.) in the different countries.

For general correspondence and for the first section address Prof. G. B. Allaria, President of the Organizing Committee, Corso Bramante 29, Torino 120. For correspondence of the second section address Dr. Paolo Gaetano, member of the organizing committee for the second section (via Angelo Brofferio 9, Roma).

*Organizing Committee*

Prof. Giovanni Battista Allaria—Director of the Pediatric Institute of the Royal University of Turin, president of the Italian Pediatric Society; president.

Dr. Paolo Gaetano—S. Attorney General of the Supreme Court of the Kingdom of Italy, vice president committed of the Italian Union of assistance to infancy (Section of the "Union Internationale de secours aux enfants" de Geneve), vice president.

Prof. Nicola Pende—Director of the Institute of Medical Pathology of the University of Rome, Senator of the Kingdom.

Prof. Francesco Valagussa—Director of the "Preventorio Maraini" in Rome, Senator of the Kingdom.

*Directions Concerning the Reports, the Communications, and the Discussions*

I. Subjects of reports.

First section—hygienic and sanitary aspects

1. Preventive measures against infant mortality from diseases of nutrition;
2. The institution of climatic colonies for children;
3. The sanitary assistance to children of Europeans in colonial countries;
4. The physical training for school children;
5. Preventive measures against the sanitary inferiority of illegitimate children.

Second section—juridical and social aspects

1. The social foresight in reference to minors and the international agreements;
2. The destiny of sons in the case of annulment or dissolution of marriage, from the juridical and social point of view;
3. In what manner the legislator can intervene for carrying into execution the principles of the statement of Geneva?
4. The juridical protection of minors in international relations;
5. The obligatory assistance to the mother and to illegitimate children.

The maximum space at the disposal of authors in the Transactions of the Congress will be the following:

For each relator—5,000 words,

For each correlator—1,500 words,

For each individual communication—700 words,

For each speaker who intervenes in the discussions—350 words,

Final dates for arranging for places on the program—May 30, 1937.

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The **American Board of Pediatrics** will hold an examination in New York City on Jan. 23, 1937, and another in Atlantic City on Sunday, June 6, 1937. This latter date comes between the meeting of the Academy and the meeting of the American Medical Association. Further information in regard to appointments for examination may be obtained from the secretary, Dr. C. A. Aldrich, Winnetka, Ill.

Dr. Arthur Stern, the organizer of the first milk dispensary and baby welfare stations in New Jersey, died November 28, 1936. Dr. Stern was born in Germany in 1868 and settled in Elizabeth, N. J., in 1892. He had specialized in pediatrics since 1911 and was Chief of the Pediatric Department of the Elizabeth General Hospital, St. Elizabeth's Hospital, and Alexian Brothers' Hospital, of Elizabeth, N. J., besides being consulting physician to the Rahway Hospital of Rahway, N. J.

Besides his membership in the American Academy of Pediatrics, Dr. Stern was a Fellow of the American College of Physicians, Fellow of the Union Internationale de Secours aux Enfants, and formerly Commissioner of Health of the City of Elizabeth. Dr. Stern was of a kindly nature and intensely interested in the welfare of children; he was one of the pioneers in pediatric work in the state of New Jersey.